SIMRAD

PRO SERIES

ARGUS RADAR S-Band

Technical User Manual

ENGLISH

ARGUS RADAR

PRO.SIMRAD-YACHTING.COM

RECORD OF CHANGES

RCS CODE/REV. INDEX	DATE	PURPOSE OF THE CHANGE	CHANGE REQUESTED BY
Revision 988-10609-001	November 2013	First issue	N/A
Revision 988-10609-002	March 2015	Front cover was updated	N/A
Revision 988-10609-003	May 2015	Image changed in section 9.4.2.2- part nr updated	FEDERICO SGRILLI

OVERVIEW OF CHAPTERS

CHAPTER 1 GENERAL INFORMATION AND SAFETY PRECAUTIONS 1.1

CHAPTER 2 DESCRIPTION AND MAIN CHARACTERISTICS.....2.1

CHAPTER 3 GENERAL OPERATION 3.1

CHAPTER 4 FUNCTIONAL DESCRIPTION 4.1

CHAPTER 5 PREVENTIVE MAINTENANCE.....5.1

CHAPTER 6 TROUBLESHOOTING.....6.1

CHAPTER 7 CORRECTIVE MAINTENANCE 7.1

CHAPTER 8 PART LIST.....8.1

CHAPTER 9 INSTALLATION.....9.1

TABLE OF CONTENTS

CHAPTER 1 GENERAL INFORMATION AND SAFETY PRECAUTIONS 1.1

1.1 Safety precautions 1.1
1.1.1 High voltage 1.2
1.1.2 Safety switch 1.2
1.1.3 Safety precautions 1.2
1.1.4 X-ray radiation 1.4
1.1.5 Radio-frequency radiation 1.4

CHAPTER 2 DESCRIPTION AND MAIN CHARACTERISTICS.....2.1

2.1 Manual applicability 2.1
2.2 Purpose of the equipment 2.1
2.3 Abbreviations 2.2
2.4 Overall dimension 2.3
2.5 Applicable configurations 2.4
2.5.1 Supported transceivers general specification 2.5
2.5.2 System interfacing definition 2.5
2.6 Physical description 2.6
2.6.1 Equipment, accessories and documents supplied 2.6
2.6.2 Antenna 2.6
2.7 Technical characteristics 2.7

CHAPTER 3 GENERAL OPERATION 3.1

3.1 Introduction 3.1
3.2 Controls and indicators 3.1
3.3 Semi-operative controls 3.4
3.4 Analysis of test points 3.7
3.5 Document transmission: video mode combined 3.10
3.5.1 TXRX – Console transmission format 3.10
3.6 I/O requirements 3.13
3.7 IEC61162 trasmission protocol 3.14
3.7.1 Data transmission from RDC to TXRX (o interfaces) 3.15
3.7.1.1 Operational control sentence – SRT Coldfire 3.15
3.7.1.2 Sector blancking sentence – SRT Coldfire 3.16
3.7.1.3 Timers initialization – SRT Coldfire 3.16
3.7.1.4 Digital potentiometers control – SRT Coldfire 3.17
3.7.1.5 Trigger delay and pretrigger lenght – SRT Coldfire 3.17

3.7.1.6 Configuration set – SRT Coldfire 3.18
3.7.2 Data transmission from TXRX (o interfaces) to RDC 3.19
3.7.2.1 Status sentence 2 – SRT Coldfire 3.19
3.7.2.2 Data sentence – SRT Coldfire 3.20
3.7.2.3 Timers information – SRT Coldfire 3.21
3.7.2.4 Digital pot. information – SRT Coldfire 3.22
3.7.2.5 Sector blanking sentence – SRT Coldfire 3.22
3.7.2.6 Configuration status – SRT Coldfire 3.23
3.7.2.7 Not acknowledge command (NACK) – SRT Coldfire 3.24
3.7.2.8 Health sentence 2 – SRT Coldfire 3.25
3.7.2.9 Data sentence 3 – SRT Coldfire 3.26
3.7.2.10 Accelerometers – SRT Coldfire 3.26
3.7.2.11 Request generic data – SRT Coldfire 3.26
3.7.2.12 Trigger delay and pretrigger length – SRT Coldfire 3.27
3.7.3 General notes 3.27

CHAPTER 4 FUNCTIONAL DESCRIPTION 4.1

4.1 Introduction 4.1
4.2 Functional description 4.1
4.3 Electronic BOARD 4.2
4.3.1 SRT POWER (SRT PWR-DC) 4.2
4.3.2 SRT MOS 4.3
4.3.3 SRT CONTROL 4.3
4.3.4 SPINT 4.4
4.3.5 Brushless controller 4.4
4.3.5.1 Luminous indicators and protections on the Brushless Controller 4.4
4.4 Electrical diagrams of the BOARDs in SRT S-Band Up Mast 4.5
4.5 RF HEAD 4.8
4.5.1 Noise diode 4.8
4.5.2 Magnetron 4.9
4.5.3 Circulator 4.9
4.5.4 Limiter 4.9
4.5.5 LNFE & RF Detector 4.10
4.6 Motor group 4.10
4.6.1 Brushless motor 4.10
4.6.2 Reducer 4.11
4.6.3 Rotating joint 4.11

4.7 Additional components 4.12
4.7.1 Bearing Reader Board 4.12
4.7.2 Fan (only for the HSC system) 4.12
4.7.3 HEATER Kit (optional) 4.12
4.8 Performance Monitor 4.13

CHAPTER 5 PREVENTIVE MAINTENANCE 5.1
5.1 Introduction 5.1
5.2 Preventive maintenance procedure 5.1
5.3 Life time components 5.5

CHAPTER 6 TROUBLESHOOTING 6.1
6.1 Introduction 6.1
6.1.1 General 6.1
6.1.2 Organization 6.1
6.1.3 Personnel 6.1
6.1.4 Tools and instruments 6.1
6.2 Troubleshhoting procedures 6.2
6.2.1 Safety precautions 6.2
6.2.2 Troubleshooting operation 6.2

CHAPTER 7 CORRECTIVE MAINTENANCE 7.1
7.1 Introduction 7.1
7.2 Safety precautions 7.2
7.3 Personnel 7.2
7.4 Required tools and instruments 7.2
7.5 Corrective maintenance procedures 7.2
7.5.1 Disassemble the inspection covers of the SRT S-Band Up Mast 7.4
7.5.2 Disassemble the motor unit 7.5
7.5.3 Substitution of the brushless motor 7.6
7.5.4 Substitution of the reducer 7.7
7.5.5 Substitution of the fan (only for HSC system) 7.9
7.5.6 Substitution of the SPINT BOARD 7.9
7.5.7 Replace the Noise diode 7.11
7.5.8 Substitution of the Brushless controller 7.11
7.5.9 Replace the Interlock 7.12
7.5.10 Substitution of the Bearing Reader Board 7.13
7.5.11 Substitution of the RF cable 7.14

7.5.12 Substitution of the Rotating Joint 7.15
7.5.13 Substitution of the Performance Monitor 7.16
7.5.14 Replace of the Magnetron 7.16
7.5.15 Removal of the Board unit and the RF HEAD 7.18
7.5.16 Replace the LNFE & RF Detector 7.19
7.5.17 Replace the Limiter 7.20
7.5.18 Replace the Circulator 7.21
7.5.19 Removal/Installation of the Electronics assy 7.22
7.6 Installation the HEATER Kit 7.27

CHAPTER 8 PARTS LIST 8.1

8.1 Introduction 8.1
8.1.1 Parts list 8.1
8.1.2 Illustration of part location 8.1
8.2 Parts list table 8.2

CHAPTER 9 INSTALLATION 9.1

9.1 Introduction 9.1
9.2 Layout And connection diagrams 9.1
9.2.1 Layout SRT S-Band Up Mast 9.2
9.2.2 Block diagram radar display with SRT S-Band Up Mast radar sensor 9.3
9.2.3 General interconnection diagram of BOARDs (standard version) 9.4
9.2.4 General interconnection diagram of BOARDs (version with SRT HEATER) 9.5
9.3 Specifications 9.6
9.3.1 Dimensions and weights (also see outline drawings) 9.6
9.3.2 Required power 9.6
9.3.3 Environmental data 9.6
9.4 Installation 9.7
9.4.1 Installation principles 9.7
9.4.2 Mechanical installation 9.9
9.4.2.1 Unit (Pedestal + Transceiver) 9.9
9.4.2.2 Antenna 9.10
9.4.2.3 Safety switch (external is optional) 9.10
9.4.2.4 Performance Monitor arm 9.11
9.4.3 Electrical installation 9.11
9.4.3.1 Multicore cable 9.11
9.4.3.2 Safety switch 9.11

9.4.3.3 Grounding 9.11
9.4.4 Pre setup procedures 9.11
9.4.4.1 Ship power voltage 9.12
9.4.4.2 Compass safe distance 9.12
9.5 Antenna installation 9.13
9.6 Multicore cable technical specification 9.14
9.6.1 Cable handling 9.15
9.6.2 Main shield and inner shields handling 9.16
9.6.3 RG coaxial cables 9.18
9.7 Software upgrade 9.20

CHAPTER 1
GENERAL INFORMATION AND SAFETY PRECAUTIONS

1.1 SAFETY PRECAUTIONS

The system is equipped with fuses protecting the electronics devices from short circuits, which may damage the equipment or cause fire.

Depending upon the material to be highlighted, the following attention headings are used in this manual.

DANGER

BEFORE TURNING ON THE RADAR, MAKE SURE THAT NO ONE IS STANDING NEAR THE ANTENNA.

WARNING

THE ELECTRONICS OF THE EQUIPMENT ARE SUPPLIED WITH THE MAINS POWER, ALSO WHEN THE EQUIPMENT IS SWITCHED OFF. FOR THIS REASON, OPENING A UNIT MUST BE PERFORMED ONLY BY SKILLED PERSONNEL.

WARNING

AN OPERATING OR MAINTENANCE PROCEDURE, PRACTICE, CONDITION AND STATEMENT WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN INJURY TO PERSONNEL OR DEATH.

WARNING

AN OPERATING OR MAINTENANCE PROCEDURE, PRACTICE, CONDITION AND STATEMENT WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN DAMAGE TO, OR DESTRUCTION OF, THE SYSTEM OR REDUCED PERFORMANCE.

NOTE

An essential operating or maintenance procedure, condition or statement which must be noticed.

When a precaution is required which relates specifically to a part of the technical manual contents, the information is given in the relevant part of the manual.

Warning and Cautions precede applicable text.

1.1.1 **High voltage**

Radar equipment includes high voltage that can cause injury or loss of life. Danger exists only when the units are opened, exposing internal circuits, as when servicing the equipment. You do not face any danger during normal operation. The SRT S-Band Radar System has been carefully designed to protect personnel from possible injury from high voltages.

Nevertheless, it is recommended that the Main Power Line shall always be OFF as an added protection when inspecting or servicing the equipment.

Although every effort has been made to eliminate danger to personnel, no responsibility is accepted for any injury or loss of life suffered in connection with this equipment.

1.1.2 **Safety switch**

The Radar Unit is provided with a safety switch, which disables the Antenna rotation during maintenance and avoids high voltage damage. Always turn the safety switch off, whenever advised in this manual (for instance, before performing any maintenance or installation procedure). Ignoring safety switch operation may produce hazard of electrocution as well as other severe injures.

1.1.3 **Safety precautions**

Purpose

The safety precautions described in this paragraph are applicable to SRT S-Band Up Mast. Depending upon the material to be highlighted, the following attention notes are used in this manual.

NOTE
An essential operating or maintenance procedure, condition or statement which must be highlighted.

Whenever a precaution, relating specifically to a part of the technical manual is needed, the information is given in the relevant part of the manual. Warnings and Cautions precede applicable text.

Safety Operations

During normal operation (front cover closed), the unit can be quickly disconnected from the main power line, setting to OFF the relevant circuit breaker located on the electric switchboard.

During maintenance (front cover opened) it is possible to turn-on the unit by setting to SERVICE MODE the SW2 switch, mounted on the RTM Supply Assy. This switch is connected in parallel with the relay, controlled by the POWER ON command, and during normal operation must be set to NORMAL. During maintenance, in order to prevent RTM occasional turning-on it is better to disconnect and insulate, momentarily, PWON terminal from the relevant terminal board.

NOTE
Main power line is always present on terminal board and on fuses.

Safety Summary

The following are general safety precautions that are not related to any specific procedure and therefore do not appear elsewhere in this technical manual. These are recommended precautions that personnel must understand and apply during most phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUIT

Operating personnel must at all times observe all safety regulations.

Do not replace components or make adjustments inside the unit with the high voltage supply turned ON. Under certain conditions, dangerous potentials may exist when the power breaker is in the OFF position, also due to charges retained by capacitors. To avoid casualties, always remove power and discharge to ground a circuit before touching it.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person initiate servicing or adjusting the unit except in the presence of someone capable of helping help.

RESUSCITATION

Personnel working with or near high voltage should be familiar with modern methods of resuscitation. Such information may be obtained from the Bureau of Medicine and Surgery.

Warning Information

The following warnings appear in the text of this technical manual, and are repeated here for emphasis.

WARNING

USE EXTREME CARE WHEN WORKING ON THE UNIT ONCE THE COVER HAS BEEN OPENED. THE MAGNETRON ASSEMBLY OPERATES AT VOLTAGES THAT MAY PROVE FATAL.

WARNING

BEWARE OF HIGH VOLTAGE CAPACITORS. IT IS NECESSARY TO SHORT-CIRCUIT THEIR LEADS BEFORE PERFORMING ANY MAINTENANCE ACTION ON THEM.

WARNING

ON THE ELECTRIC SWITCHBOARD, SET TO OFF THE POWER BREAKER DEDICATED TO THE PRESENT EQUIPMENT AND HANG TO IT A PLACARD READING: “WORK IN PROGRESS-DO NOT SWITCH ON”.

WARNING

USE EXTREME CARE WHEN WORKING ON THE EQUIPMENT ONCE THE FRONT COVER HAS BEEN OPENED. THE MAGNETRON ASSEMBLY OPERATES AT VOLTAGES THAT MAY PROVE FATAL.

WARNING

SET MAIN LINE BREAKER TO OFF BEFORE REPLACING ANY FUSE. FUSES ARE UNDER VOLTAGE LEVELS WHICH MAY PROVE FATAL.

1.1.4 X-ray radiation

X-RAY radiation may be generated by Transceiver units and care must be taken to avoid possible harmful effects when they are opened for maintenance. When power is on, care should be taken not to approach **closer than 1 ft. from the unit unless front cover is in place**.

1.1.5 Radio-frequency radiation

Harmful effects (particularly to the eyes) may be caused by exposure of any part of the human body to radio-frequency mean power densities. Hazard distances at which power densities of 100 W/ m², 50 W/ m² and 10 W/m² exist, are given in the following table.

Table 1.1.1 Hazard zone

Configuration	On the antenna surface [W/m²]	Distance at 0,9 m in front of the antenna [W/m²]
30 kW Transceiver + 12'S-Band Antenna (ANT12S/LP)	28	10

The system is however designed to disable radiation when the antenna is not rotating.

The pedestals have also been predisposed for the installation of an external safety switch, which can be mounted on, or near the platform. This switch removes power from the Pedestal eliminating the possibility of accidental operation during servicing and also causes disabling of transmission.

Whenever it is necessary to disconnect the waveguide system from a radar transmitter for maintenance purpose, the transmitter output should, when practicable, be terminated in a matched load. If this is not possible, care should be taken to avoid standing in front of an open-ended waveguide from which power is being radiated.

NEVER look down a waveguide/coaxial cable from which power is being radiated.

CHAPTER 2
DESCRIPTION AND MAIN CHARACTERISTICS

2.1 MANUAL APPLICABILITY

The present technical manual provides information, data, and procedures relevant to general description, operation, functional description, preventive maintenance, troubleshooting, corrective maintenance and replaceable parts list of the SRT S-Band Up Mast.

For brevity of description, reference to the equipment in this manual, can also be made by means of the Manufacturer code name: **UP MAST/S-001 - UP MAST/S-002** (version HSC)

The contents of the present technical manual are arranged in chapters according to the following:

Chapter 1 - General Information and Safety Precaution
Chapter 2 - Description and Main Characteristics
Chapter 3 - General Operation
Chapter 4 - Functional Description
Chapter 5 - Preventive Maintenance
Chapter 6 - Troubleshooting
Chapter 7- Corrective Maintenance
Chapter 8 - Part List
Chapter 9 - Installations

NOTE
In this manual: Illustrations, description and technical data may be changed without notice.

2.2 PURPOSE OF THE EQUIPMENT

The SRT S-Band Radar System, when connected to a Display Unit (not described in this manual), performs the following functions:

- It receives the radar controls from the Display Unit connected to the equipment.
- It generates and receives the RF pulses.
- It processes the RF pulses.
- It sends the radar data and controls to the Display Unit.

2.3 **ABBREVIATIONS**

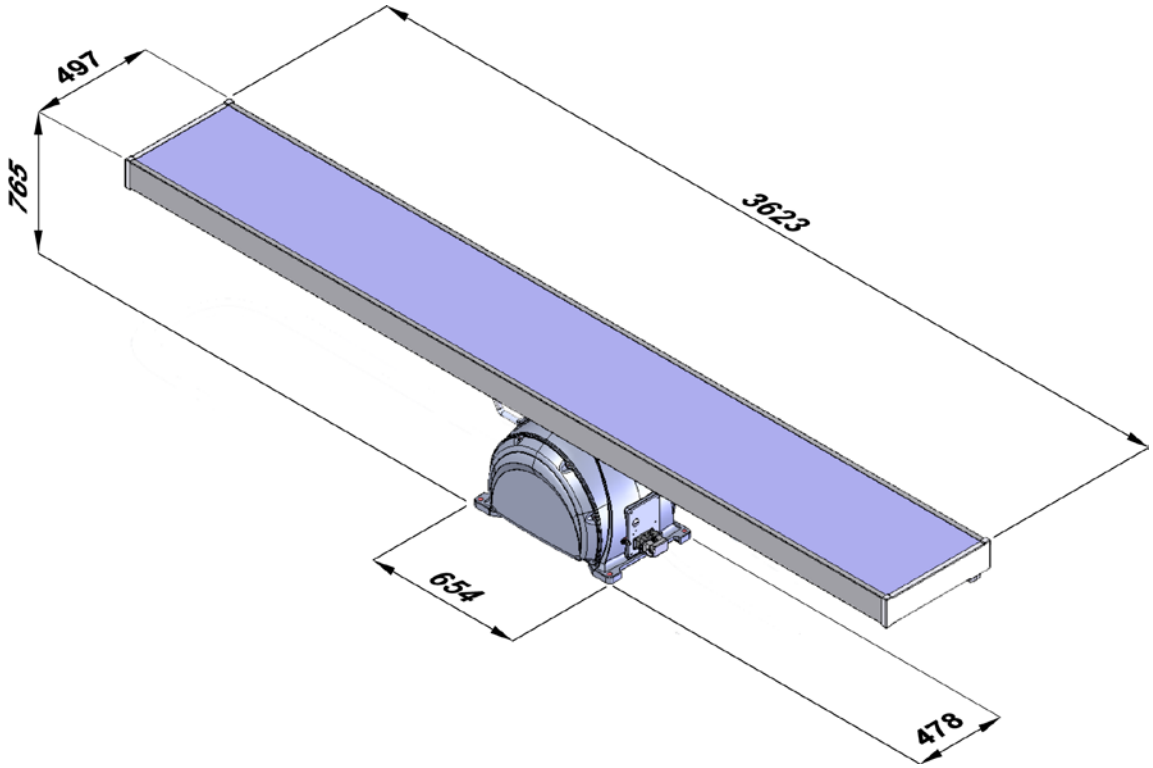
Very often navigation related information's are presented using the standard terms or abbreviations. In the Following Table you will find the most common abbreviations and the ones used in this manual.

Table 2.3.1 Abbreviations

TERM	ABBREV.	TERM	ABBREV.
Alternating Current	AC	Low Voltage	LV
Antenna Azimuth Pulse	AZ	Magnetron	Mag
Direct Current	DC	Minimum Detectable Signal	MDS
Decibel	dB	Mean Time Between Failures	MTBF
Decibel referred to 1 milli-Watt	dBm	Pulse Repetition Frequency	PRF
Heading Line	HL	Resistor - Capacitor	RC
Higt Speed Craft	HSC	Radio Frequency	RF
High Voltage	HV	Revolution per Minute	RPM
Intermediate Frequency	IF	Radar Transceiver	TXRX
Light Emitting Diode	LED	Sensitivity Time Control	STC
Long Pulse	L.P.	Transistor-Transistor Logic	TTL
Local Oscillator	LO	Voltage Controlled Oscillator	VCO
Low Noise Front End	LNFE	Waveguide	WG

2.4 **OVERALL DIMENSION**

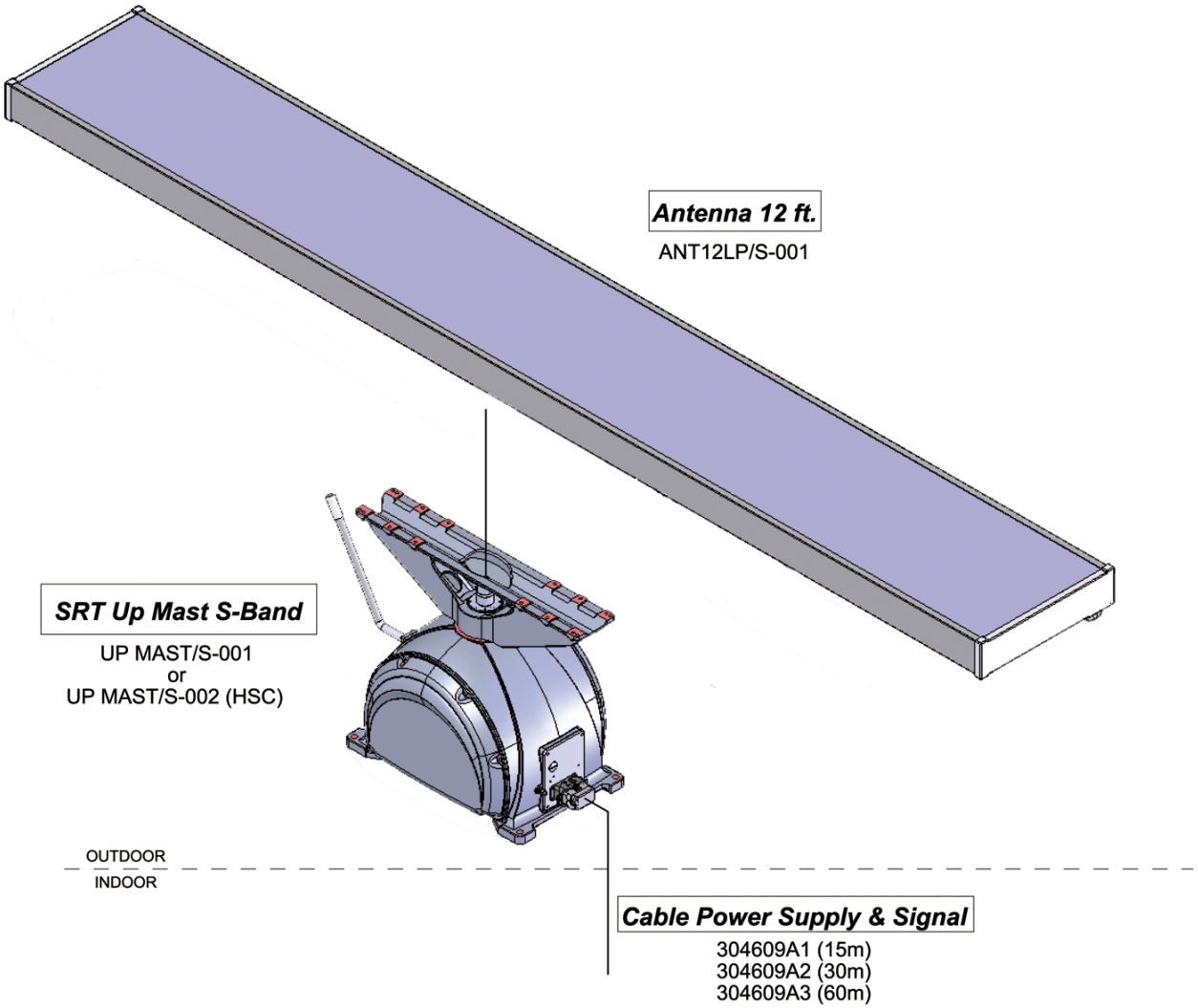
In the below figure, the maximum overall dimension of the SRT S-Band Up Mast are indicated.



1.1.1 *Maximum overall dimensions of the SRT S-Band Up Mast*

2.5 APPLICABLE CONFIGURATIONS

This paragraph graphically illustrates the various possible configurations with which the SRT S-Band Up Mast can be connected to the SRT Pedestal and the three supported antennas. Furthermore, the types of connection cables are illustrated and the separation between them in an enclosed environment and also outdoors (see dotted line).



1.1.2 *Block diagram of the various applicable configurations*

WARNING

LONG TRANSMISSION LINES, COAXIAL CABLES FOR S-BAND AND WAVEGUIDE FOR SRT S-BAND UP MAST TRANSCEIVER CAN AFFECT THE RADAR PERFORMANCE. THE SYSTEM HAS BEEN TESTED WITH 20M LENGTH FROM TRANSCEIVER TO THE ANTENNA PEDESTAL, CONSIDER THAT TRANSMITTED/RECEIVED POWER ARE HALVED FOR EVERY 10 MS ADDED (EX: +20M = -6DB SIGNAL/NOISE). CLEARLY THIS AFFECTS DETECTION FOR FAR TARGETS AND FOR SMALL/LOW REFLECTIVITY ONES LIKE SAIL SHIPS. HIGHEST MAST POSITION IS GOOD FOR LONG RANGE DETECTION BUT IT AFFECTS HEAVILY THE DETECTION IN SEA CLUTTER, FOR OPTIMAL DETECTION IN SEA CLUTTER SUGGESTED ANTENNA HEIGHT FROM SEA LEVEL IS AROUND 20M.

USUALLY THE CONTRADICTORY SPECIFICATIONS ARE SOLVED WITH INSTALLATION OF MORE THAN ONE ANTENNA, FOR EXAMPLE ONE AT 30M FOR LONG RANGE DETECTION AND ONE AT 20 M FOR OPTIMAL DETECTION OF LOW INTENSITY ECHOES IN SEA CLUTTER.

S-BAND TRANSCEIVER USE IS ALWAYS THE OPTIMAL CHOICE FOR REDUCING RAIN CLUTTER REFLECTIONS AND INCREASE LONG RANGE DETECTION.

LONGER ANTENNAS FOR S-BAND ARE LESS SUSCEPTIBLE TO RAIN AND SEA CLUTTER.

WARNING

THE RADAR UNIT IS PROVIDED WHIT A SAFETY SWITCH, WHICH DISABLE THE ANTENNA MOVEMENT DURING MAINTENANCE OPERATIONS AND AVOIDS HIGT VOLTAGE DAMAGE. ALWAYS TURN THE SAFETY SWITCH OFF, WHENEVER ADVISED IN THIS MANUAL (FOR ISTANCE, BEFORE PERFORMING ANY MAINTENANCE OR INSTALLATION PROCEDURE). IGNORING SAFETY SWITCH OPERATION MAY PRODUCE HAZARD OF ELECTROCUTION AS WELL AS OTHER SEVERE INJURES.

2.5.1 **Supported transceivers general specification**

TXRX/Pedestal Unit Type	Band	Output Power	Type	HSC	Category	Rotation speed	Category of ship/craft
UP MAST/S-001	S-Band	30 KW	Up Mast	No	Exposed	22 rpm	CAT1/CAT2
UP MAST/S-002	S-Band	30 KW	Up Mast	Yes	Exposed	44 rpm	CAT1H/CAT2H

2.5.2 **System interfacing definition**

During the setting-up phase or after a system check-up it is possible to define all the values and their characteristics. The values to be defined and/or changed are:

- Azimuth; - Video Signal;
- Heading Line; - Trigger;
- Skew Azimuth; - Antenna type;
- Trigger Delay; - Transceiver I/O connection.

2.6 PHYSICAL DESCRIPTION

The SRT S-Band Up Mast 30 kW Radar System is composed of (Refer to the table in Chapter 8):

- The Antenna: 12 feet
- The Pedestal

All Units are designed for maximum resistance to the severe environmental conditions in which they have to operate.

2.6.1 Equipment, accessories and documents supplied

POS.	DESCRIPTION	CODE	WIDTH (MM)	DEPTH (MM)	HEIGHT (MM)	WEIGHT (KG)
1	30 Kw S-Band Receiver Transmitter Modulator and Antenna	Unit type: UP MAST/S-001 – UP MAST/S-002 (HSC) with ANT12LP/S-001	**654***	**478***	**765**	**75***
			3623**	**497****		**50****
2	Technical manual	189-10609-001	**N.A.**			

(*) Without Antenna
(**) With 12 ´Antenna

2.6.2 Antenna

The Antenna available is: **ANT12LP/S-001**

The Antenna is fixed to the SRT-Pedestal Support by means of some screws.

The antenna consists of:

- a side feeded slotted waveguide of 12 feet lengths.
- a polarisation to radiate only in horizontal polarization.
- a plastic external cover for weather protection.

The antenna is mounted on the pedestal by the antenna support structure with 12 screws. This support structure makes the antenna more rigid against wind and vibration.

2.7 **TECHNICAL CHARACTERISTICS**

Technical Data Sheet of the SRT S-Band Up Mast Radar System:

Table 2.7.1 SRT S-Band Radar System technical Data Sheet

1. ANTENNA & DRIVER - TECHNICAL SPECIFICATIONS		
Antenna model	12S/LP	
Antenna Unit Type I/N	ANT12LP/S-001	
Pedestal Unit type I/N:	PED/S-001 PED/S-002 (HSC)	
Antenna type	End-fed-slotted wave guide	
Category	Exposed	
Antenna length (inch / mm)	12' / 3623	
Antenna swing circle (mm)	3695	
Frequency (MHz)	3000 ÷ 3100	
Polarization	Horizontal	
Gain (dB)	≥ 27°	
Horizontal beam width at -3 dB	1.9°	
Vertical beam width at -3 dB	4.4°	
Horizontal side lobes (dB): - within 10° - outside 10°	 ≤ - 23 ≤ - 30	
VSWR	Better than 1.20	
PPR	128 pulses 1024 / 4096 /8192 with encoder	
Nominal Rotation speed (RPM)	≥ 20	≥ 40 (HSC)

2. S-BAND TRANSCEIVER - TECHNICAL SPECIFICATIONS	
Nominal peak power (KW):	30
Operating frequency (MHz):	3050 ± 30 (S-Band)
Pulse length (nsec.):	60 - 250 – 800
PRF (Hz):	3000-1500-750
Modulator:	MOSFET solid state
IF amplifier:	Logarithmic
IF dynamic (dB)	≥ 90 dB +15 pre STC
IF center frequency (MHz)	50
IF bandwidth (MHz): - short pulse - medium pulse - long pulse	 24 5 2
Overall noise figure (nominal dB)	5
MDS on long pulse (dBm): - Overall at receiver level: - At IF level:	 ≤ - 100 ≤ - 110

(*) EEV 4rth generation magnetron is 10.5 KW, NJRC is 12 KW

ENVIRONMENTAL FEATURES	
Operating temperature	-25°C / +55°C As in IEC 60945
Storage temperature	-25°C / +70°C As in IEC 60945
Relative humidity	Up to 95% at + 40° As for IEC 60945
Vibrations	As for IEC 60945
International Protection (IP)	IP 66
DIMENSIONS	
Width	654 mm
Depth	478 mm
Height	765 mm
WEIGHT	
12 Ft. Antenna	50 Kg
Pedetal with transceiver	75 Kg
REQUIRED POWER SUPPLY	
Standard configuration	115÷220 VAC - 56÷60 Hz or 48VDC
Transceiver only	80 W
With 100 KN	350 W
With 100 KN (HSC)	850 W
Medium power cunsumption 30 kW / 12 SLP	170 W
Medium power cunsumption 30 kW / 12 SLP (HSC)	280 W
OPTIONS	
Different PRF set	Upon Customer request
Heaters	For very cold environment (< -25° C)

CHAPTER 3
GENERAL OPERATION

3.1 INTRODUCTION

The present chapter provides the operating instructions, information and procedures required in order to enable operating personnel to efficiently and effectively operate the SRT S-Band Up Mast 30 Kw, for it to accomplish its designated tasks.

The Chapter is divided in:

Paragraph 3.2 Controls and indicators
Paragraph 3.3 Semi-operative controls
Paragraph 3.4 Analysis of test points
Paragraph 3.5 Document transmission: video mode combined
Paragraph 3.6 I/O requirements
Paragraph 3.7 IEC61162 trasmission protocol

The Unit does not require personnel on steady watch conditions, but requires general monitoring during normal operating situations. Since, the Unit has no operating controls, paragraph 3.2 is not applicable. All semi-operative controls are located inside the unit.

3.2 CONTROLS AND INDICATORS

The various types of LED visible by the operator at the moment of disassembling the front panel of the Up Mast are listed in this paragraph. The tables below show in order:

- The board in which they are positioned
- The part number of the board
- The LED code
- The LED colouration
- The type of illumination frequency
- A brief description of their function

NOTE
Regarding the location of the LEDs, Test Points and Jumpers that will be described, refer to the electrical diagrams and images shown as follows

Table 3.2.1 Behaviour of the LEDs on the SRT CONTROL in Serial* configuration

BOARD	PART NUMBER	CODE (REF. ASSY)	LED	FREQUENCY	FUNCTION
SRT CONTROL	973281A2	D3	Green	Gradually slower	Refer to 1.1.3
SRT CONTROL	973281A2	D23	Red	On/off normal	The SRT S-Band Up Mast is transmitting

Table 3.2.2 Behaviour of the LEDs on the SRT CONTROL in Combined Video* configuration

BOARD	PART NUMBER	CODE (REF. ASSY)	LED	FREQUENCY	FUNCTION
SRT CONTROL	973281A2	D3	Green	Gradually slow flashing	Refer to 1.1.3
SRT CONTROL	973281A2	D23	Green	Off	The SRT S-Band Up Mast is not trasmitting data to the console
SRT CONTROL	973281A2	D26	Green	Fixed	If Power Supply on SRT PWR-DC BOARD > 42V
			Red	Off	If Power Supply on SRT PWR-DC BOARD < 38V

*The combined video or serial configurations is determined by settings the Jump J10

Table 3.2.3 Status Led D3 - Blinking red if :

FAIL	CONFIGURATION	CAUSE
Mag heater fail	(L.P. + S-Band)	Vfil < 4.5 V and > 6.5 V
24 VCO fail	(for all configurations)	24 V (voltage) < 18 V and > 30 V
+15 fail	(for all configurations)	15 V (voltage) < 14 V and > 16 V
Rx fail	(for all configurations)	If no packet has been received after 5 seconds
CRC fail	(for all configurations)	If there is a CRC failure in receiving a packet
Interlock open	(for all configurations)	If the interlock is open
Safety switch open	(for all configurations)	If the safety switch is open
+24 fail	(for all configurations)	< 18 V if power supply of SRT is 24 V
+48 fail	(for all configurations)	< 40 V if power supply of SRT is 48 V
Front end fail	(for all configurations)	If Monitor voltage is < 35 mV and > 65 mV

3.3 SEMI-OPERATIVE CONTROLS

Some semi-automatic controls, test points and jumpers are listed in this paragraph that are useful to the operator to carry immediate checks of the machine and verify the correct functioning. Opening the front panel of the SRT S-Band Up Mast, there is the possibility of carrying out certain types of checks. These controls are summarised in the tables below and subdivided on the basis of the BOARDs on which they are located.

ATTENTION: When the front panel of the SRT S-Band Up Mast is opened, the first safety switch called Interlock is activated. For extra safety, this spring switch which opens at the moment the panel is removed interrupts the transmission that disenables the 700 V High Voltage that the SRT MOS BOARD requires. Anyway, to carry out a check as if the panel was closed, pull it towards the outside and everything functions simulating a standard situation as if the front panel was mounted.

Table 3.3.1 Semi operative controls

<table>
<tr><th>POS.</th><th>CODE (REF. ASSY)</th><th>TYPE</th><th colspan="2">FUNCTION</th></tr>
<tr><td>Structure SRT S-Band Up Mast</td><td>S1</td><td>Interlock</td><td colspan="2">TXRX cover interlock switch for disabling the High Voltage generation and interrupts the transmission</td></tr>
<tr><td rowspan="7">SRT CONTROL</td><td rowspan="7">S1</td><td rowspan="7">10 Position rotary switch</td><td colspan="2">It selects the TXRX unit operation mode as follow:</td></tr>
<tr><td>POS.</td><td>Function</td></tr>
<tr><td>0</td><td>SRT under external control 1</td></tr>
<tr><td>1</td><td>SRT under external control 2</td></tr>
<tr><td>2</td><td>SRT in local stand-by</td></tr>
<tr><td>3</td><td>The SRT works independently from the console with short pulses.</td></tr>
<tr><td>4</td><td>The SRT works independently from the console with medium pulses.</td></tr>
<tr><td>5</td><td>The SRT works independently from the console with long pulses.</td></tr>
</table>

			6	SRT in local with long pulse and performance monitor with auto tuning and antenna rotation
			7	Standby mode
			8	Standby mode
			9	Service mode Long pulse. Performance monitor ON. Autotune. Antenna rotating.

Table 3.3.2 Test points on SRT CONTROL

TEST POINTS LIST		DESCRIPTION
TP1	HVON	High voltage ON
TP2	+5 V	
TP3	PWON OUT	Test signial configurable
TP5	+24 V	Power Supply from SRT PWR-DC BOARD
TP6	VCO	IF tunable oscillator voltage
TP7	-15 V	Power Supply from SRT PWR-DC BOARD
TP8	+15 V	Power Supply from SRT PWR-DC BOARD
TP9	PWON OUT	24 V needed to switch on the system
TP10	VFIL	Magnetron heater voltage
TP11	-5 V	Power Supply from SRT PWR-DC BOARD
TP12	PRESTC	Short range fixed attenuation
TP13	ANTS	Antenna start output
TP14	TROUT	Trigger output
TP15	RXCOMB	Rx data signal in combined mode

TEST POINTS LIST		DESCRIPTION
TP16	LINE	Input voltage sense
TP17	TXCOMB	Tx data signal in combined mode
TP18	GND	Ground
TP19	VDIN	Video input from RF Detector BOARD
TP20	VDOUT	Combined video output
TP21	RX	Serial data reception
TP22	TX	Serial data trasmission
TP23	AZ OUT	antenna azimuth output
TP24	HL OUT	Antenna heading line output
TP25	TRPUSH	Modulator trigger push control
TP26	TRPULL	Modulator trigger pull control
TP27	MOTOR CURRENT	Motor current sense
TP28	GND	Ground
TP29	GND	Ground

Table 3.3.3 Jumpers on SRT CONTROL

JUMPERS LIST		
NAME	**OPEN**	**CLOSE**
J7	Serial mode transmission	Video combined mode trasmission
J8*	Warmup counts 3 minutes before transmission	Warmup counts 0 minutes
J10	Is not possible load the boot processor	Is possible load the boot processor
J21	When is one noise diode	When is two noise diodes

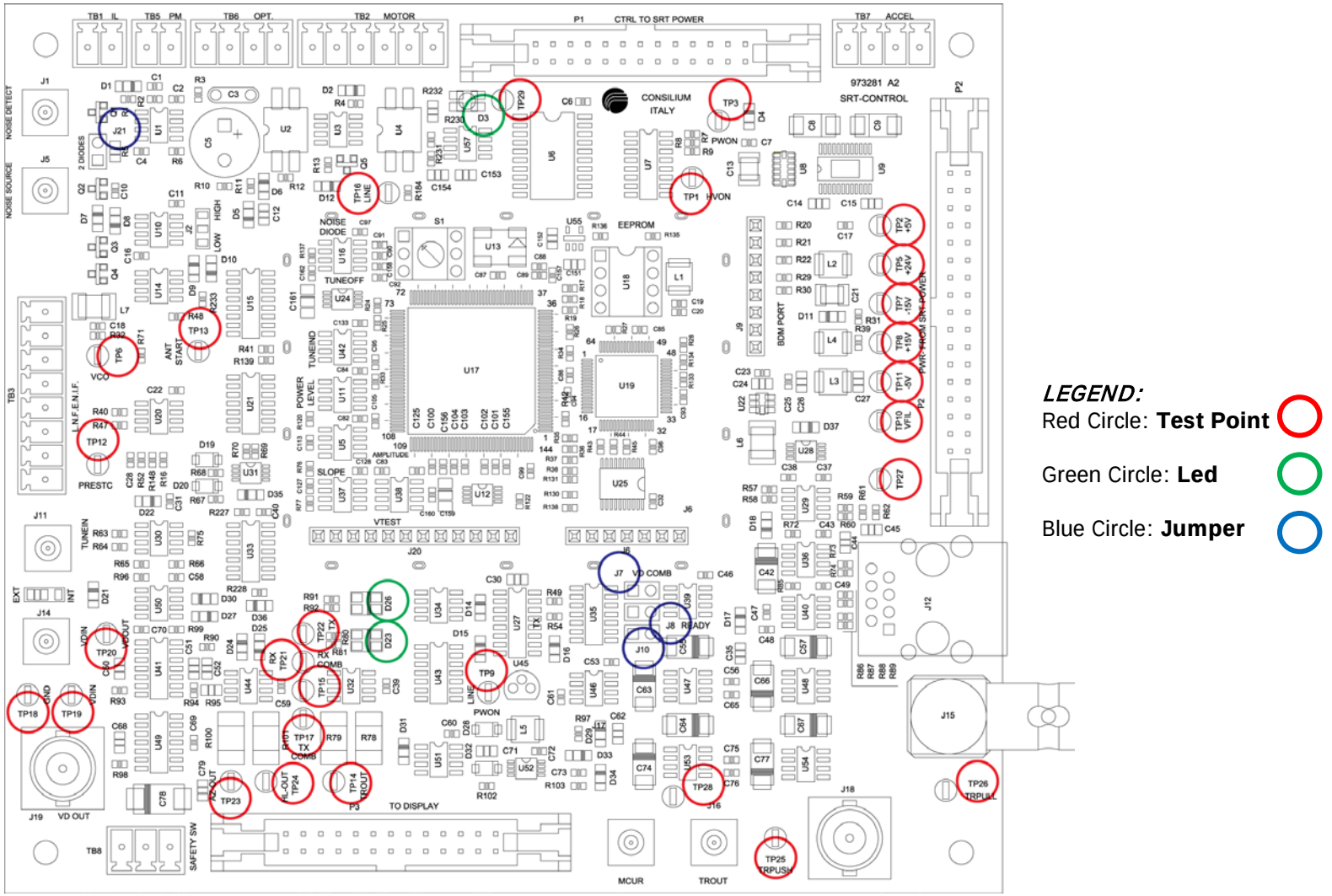
* This jumper must always be open, to allow the three-minute warmup. This time allows the magnetron to come up to temperature. The transaction's closing Jumper J8 can be performed only by a technician.

WARNING

REMEMBER AFTER EVERY OPERATION PERFORMED ON THE JUMPER 8 TO OPEN IT TO ALLOW FOR WARMUP.

NOTE

Refer to the SRT CONTROL electrical diagram to visualise where the Test Points and Jumpers are positioned.



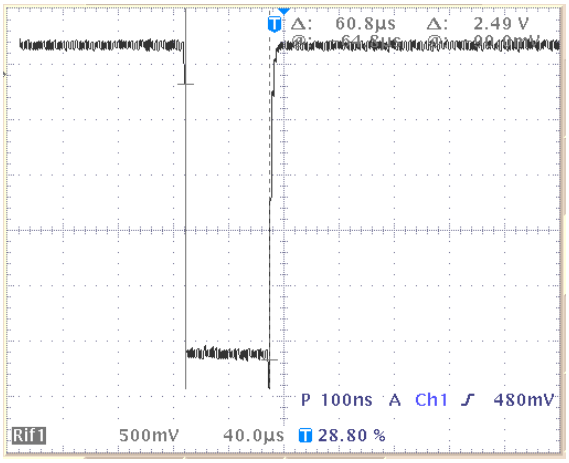
LEGEND:
Red Circle: **Test Point**
Green Circle: **Led**
Blue Circle: **Jumper**

1.1.3 *Test points, LEDs and Jumpers relative to the SRT CONTROL*

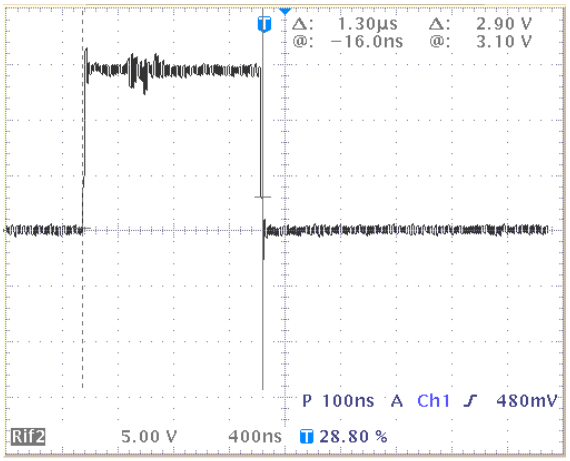
3.4 ANALYSIS OF TEST POINTS

In this section shows the images of some test point, analyzed by an oscilloscope.

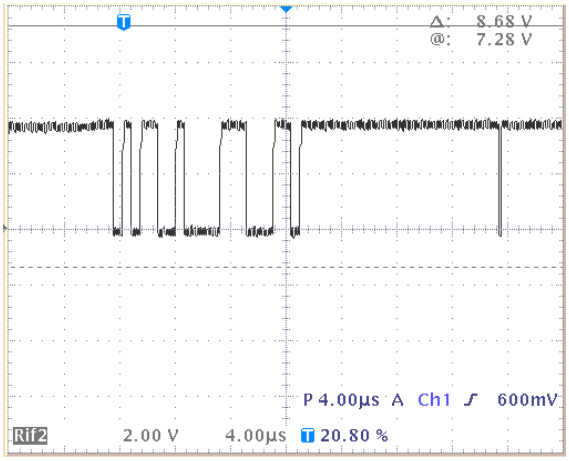
These images can be taken as a reference because they represent the smooth operation of SRT S-Band Up Mast.



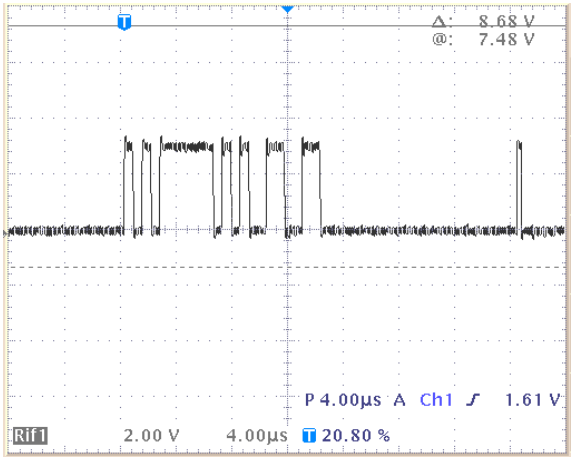
TP12 - Prestc



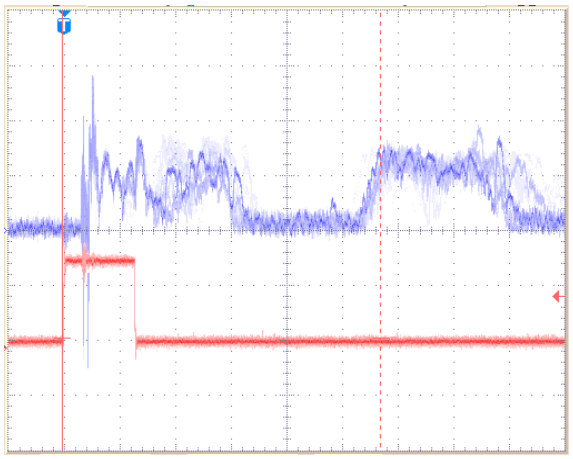
TP14 - Trout



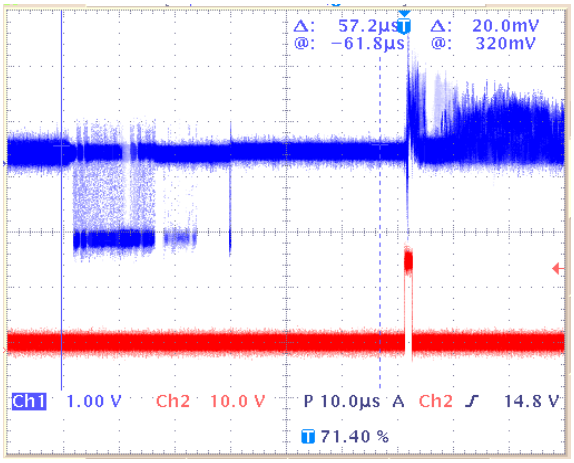
TP15 - Rxcomb



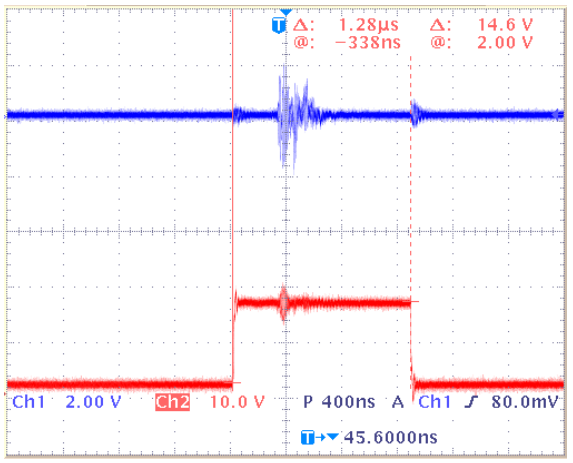
TP17 - Txcomb



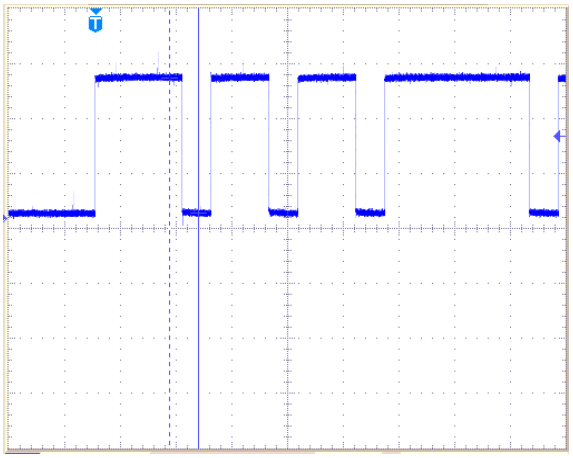
TP19 – Vdin



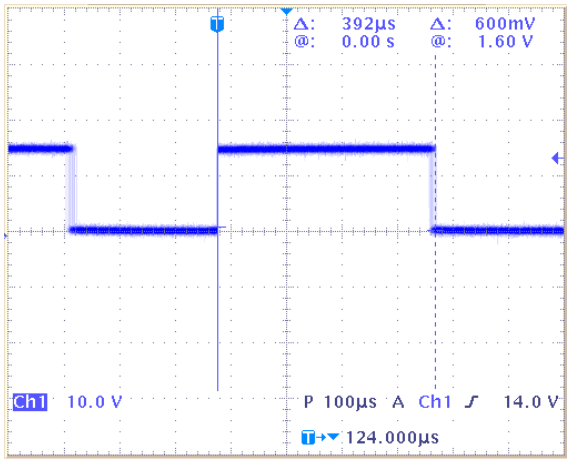
TP20 – Vdout



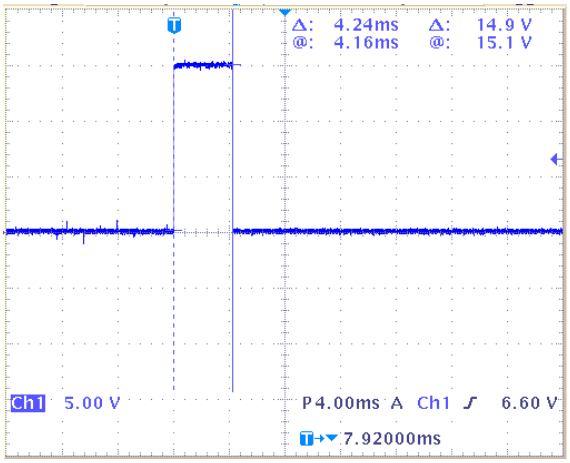
TP21 - Rx



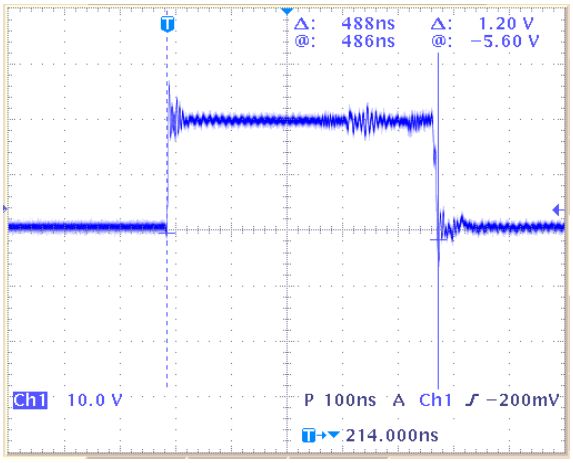
TP22 - Tx



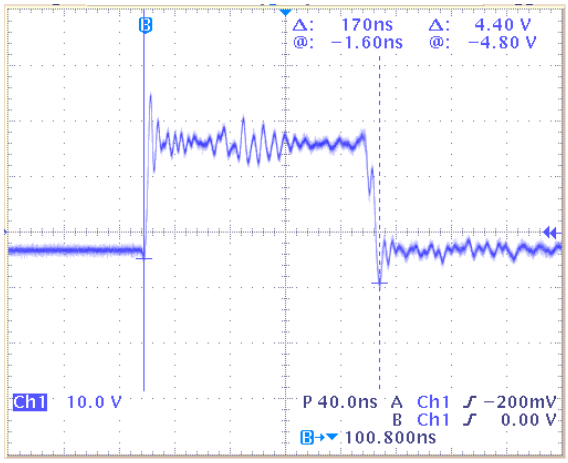
TP23 - Az out



TP24 - Hl out



TP25 - Trpush



TP26 - Trpull

3.5 DOCUMENT TRANSMISSION: VIDEO MODE COMBINED

3.5.1 TXRX – Console transmission format

Trigger Frame Timings

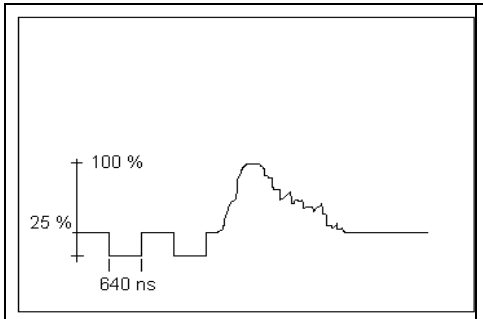
Cell Period 640 ns.

Transmission time 640 x 34 = 21.760 us

Each Packet is composed by a sync preamble 0101, antenna azimuth position, heading line flag, read-write bit, parity bit and an optional data packet sent from the RTM or the consoles.

0	1	0	1	A 0	A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	A 10	A 11	A 12	HL	RW	ID 0	ID 1	PAR	1	ID	1	0	D 0	D 1	D 2	D 3	D 4	D 5	D 6	D 7	1..	..1	SYN

BIT NAME	DESCRIPTION
0	Logic zero.
1	Logic one.
A[12:0]	Azimuth data from RTM.
HL	Heading Line flag.
RW	Read Write Flag. 0 means RTM is sending next data packet. 1 means RTM is ready to accept a data packet coming from the console.

 **ID[1:0]**	Identifier Selection. This data field increments each transmitted frame. Each RTM master with priority ID[1:0] sends on bit ID a 0 to arbitrate mastership.
PAR	Parity Flag for Azimuth + HI + RW + ID bits.
ID	Identity Code. During Console transmission each potential master drives this bit (ID[1:0] = 3 highest priority, 0 lowest priority) to 0. Only the console with higher priority will transmit the data. During RTM data transmission is driven 1. ID is always received from all consoles, so they know who owns the transmitter.
D[7:0]	Transmitted/received data.
SYN	Video Presync, Video will start at the rising edge.

Baud Rate

At 800 Hz prf is 8000 half-duplex.

At 1600 Hz prf is 16000 half-duplex.

At 3200 Hz prf is 32000 half-duplex.

Maximum Distance Between Last Console and TXRX

Delay from RX to TX is 400ns. RG59 speed 70%c 480ns/50m forward/backward. Distance = (640*3-400)*50/480 = **160 m**

Maximum Distance between first and last Console

Distance = (640*2-400)*50/480 = **90 m**

Video Level

Synchronism lower part is used to control the DC restore of the combined video in input.

Synchronism amplitude (25% of the full scale) is used to set the automatic gain control. The RTM is switched on using a 24 VDC added to the signal.

NOTE
When you have the video connection cable combined triaxial BNC,
refer to paragraph 9.6.1 - Cable handling.

3.6 **I/O REQUIREMENTS**

In this paragraph are reported the minimum and maximum values of input and output related to the SRT S-Band Up Mast. The Table 3.6.1- I/O Requirements has been divided into four columns of which:

- **SIGNAL NAME**: Type of Signal analyzed;
- **TYPE**: Identifies the type of signal being analyzed;
- **DESCRIPTION TYPE**: Reference values that should appear during the measurement (in case of correct operation).

Table 3.6.1 I/O Requirements

SIGNAL NAME	TYPE	DESCRIPTION TYPE
VDOUT	POLARITY	Positive
	AMPLITUDE	1 to 4 Vpp adjustable
	LOAD	Terminated 75 Ω (always present on Board)
	BANDWIDTH	2 - 5 - 24 MHz (-3 db)
	DC LEVEL	0 v
SFR	OPEN COLLECTOR INPUT	Contact to ground to enable antenna rotation 15 V pullup 5 mA max absorbed load
V50M	AMPLITUDE	Power supply 50 ± 2 VDC motor supply
V50E	AMPLITUDE	Power supply 50 ± 2 VDC electronics supply

3.7 **IEC61162 TRASMISSION PROTOCOL**

Abbreviations:

- **RDC** - Radar Display Console
- **TXRX** - Transceiver (TX/RX)
- **CRC** - Checksum Field

FIELD TYPE	SYMBOL	DEFINITION
Status	A	A = Yes, data valid, warning flag clear. V = No, data invalid, warning flag set.
Variable Numbers	x.x	Variable length integer or floating numeric field. Optional leading and trailing zeros. The decimal point and associated decimal fraction are optional if full resolution is not required (example: 73.10 = 73.1 = 073.1 = 73).
Fixed HEX field	hh-	Fixed length HEX number only, MSB on the left.
Variable text	c—c	Variable length valid character field.
Fixed alpha field	aa-	Fixed length field of upper-case or lower-case alpha characters.
Fixed number field	xx-	Fixed length field of numeric characters.
Fixed text field	cc-	Fixed length of valid characters.

NOTE ¹ Spaces shall only be used in variable text fields.

NOTE ² A negative SIGN "-" (HEX 2D) is the first character in a field if the value is negative. When used, this increases the specified size of fixed length fields by one. The sign is omitted if the value is positive.

3.7.1 **Data transmission from RDC to TXRX (o interfaces)**

3.7.1.1 Operational control sentence – SRT Coldfire

$PCO2,x,a,aa,aaa,a,a,a,a,hh,a*hh<CR><LF>

- │ │ │ │ │ │ │ │ └─ MGN Heater: **W =** warm, **C** = cold else **NULL (AUTO)**
- │ │ │ │ │ │ │ └─ Tuning adjust (min 00H, max FFH). If Automatic don't care.
- │ │ │ │ │ │ └─ **M** = Manual Tuning, **A** = Automatic Tuning
- │ │ │ │ │ └─ **V** = Video test else NULL (OFF)
- │ │ │ │ └─ **P** = Performance Monitor ON else NULL (OFF)
- │ │ │ └─ **J** = Jitter ON else NULL (OFF)
- │ │ └─ **Rxx** = Antenna Rotating ON with xx RPM (01 ÷ 60) else NULL (OFF)
- │ └─ Transceiver control **(³)**
- │ └─ **M** = Request Master of Transceiver, **S** = Slave **(²)**
- └─ Selected Transceiver Number **(¹)**

Notes:

(¹) Transceiver Number: 1, 2, 3, 4 **(SPARE in stand alone TXRX)**

(²) Master/Slave request **(SPARE in stand alone TXRX and single equipments)**

(³) Transceiver control:

FIELD TYPE	FIELD DESCRIPTIONS
SB	Standby
SH	Short pulse, High frequency
SM	Short pulse, Medium frequency
SL	Short pulse, Low frequency
MM	Medium pulse, Medium frequency
ML	Medium pulse, Low frequency
LL	Long pulse, Low frequency

3.7.1.2 Sector blancking sentence – SRT Coldfire

$PSE2,a,x.x,x.x,x.x,x.x*hh<CR><LF>

```
      | | |  |  |
      | | |  |  └─ End Sector 2
      | | |  └──── Start Sector 2
      | | └─────── End Sector 1 (¹)
      | └────────── Start Sector 1
      └──────────── D = Sector Blanking Values, R = Sector Blanking Request (²)
```

Notes:

(¹) Start & End Sector units are degree integer value. Es: 123 - 71

This value will be rounded depending from the position sensor used

(²) If Sector Blanking Request, don't care

3.7.1.3 Timers initialization – SRT Coldfire

$PTIM,x,x,x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x*hh<CR><LF>

```
      | | | |  |  |  |  |  |  |
      | | | |  |  |  |  |  |  └─ Timer M-Pulse Low Freq.
      | | | |  |  |  |  |  └──── Timer S-Pulse Low Freq.
      | | | |  |  |  |  └─────── Timer S-Pulse Medium Freq.
      | | | |  |  |  └────────── Timer L-Pulse Low Freq. (²)
      | | | |  |  └───────────── Timer M-Pulse Medium Freq.
      | | | |  └──────────────── Timer S-Pulse High Freq.
      | | | └─────────────────── Timer Standby
      | | └───────────────────── Status 3
      | └─────────────────────── Status 2
      └───────────────────────── Status 1 (¹)
```

Notes:

(¹) Command 1: **1** = Request for transmission of actual values

2 = Initialization of values .

3 = Reset of values.

Command 2: Spare

Command 3: Spare

(²) Timers : Integer value to pre-set the operated time. LSB is equal to 1 hour.

If **Command 1 = 1 or Command 1 = 3** don't care.

3.7.1.4 Digital potentiometers control – SRT Coldfire

$PDPC,a,x,x*hh<CR><LF>

```
        │ │ │
        │ │ └─ Potentiometer increment signed value (³)
        │ └─ Potentiometer ID (²)
        └─ R = potentiometer value Request, F = potentiometer Factory preset else NULL (¹)
```

A = auto adjust (°)

Notes:

(¹) Factory preset is available for latest TX/RX versions.

(²) Pot. ID

Potentiometer to be upgraded:

0 PRE-STC AMPLITUDE

1 PRE-STC SLOPE

2 P.M. OPEN

3 P.M. DISTANCE (Power Level)

4 TUNING INDICATION

5 TUNE OFFSET

6 NOISE DIODE CURRENT

(³) Increment or decrement to apply (range ±7). **(NEVER SEND 0)**

(°) If "A" with pot id, adjust only the correspondent Pot. (not yet).

If "A" without pot id (,,), adjust all the auto adjustable (Tune offset for now).

Sentence should be sent under operator request only. Application of value is immediate but storage of this one (not volatile memory) will take place after 20 seconds from last change i.e. from last **DPC** sentence reception.

3.7.1.5 Trigger delay and pretrigger lenght – SRT Coldfire

$PDLY,xx,xx*hh<CR><LF>

```
        │  │
        │  │
        │  └─ Pretrigger length in 10ns units. Max value is 511 (5.12 usec). Min. 48 (480ns)
        └─ -1 to request values back. Trigger Advance Delay in 10ns units.
```

Trigger advance delay. A delay is inserted between trigger and video, delaying the pulse transmission. Max delay 2047 units (20.48 usec), Minimum Delay 1 (10ns).
All numbers are positive starting from 0.

3.7.1.6 Configuration set – SRT Coldfire

$PCFG,x,x,x,xxxx,h,,a,h,hhh*hh<CR><LF>

```
| | |  |  | | |  |
| | |  |  | | |  |
| | |  |  | | |  └─ Optional parameters. 12 bits in hex format (6)
| | |  |  | | └─ Configuration. 4 bits in hex format.(5)
| | |  |  | └─ Performance monitor available.(4)
| | |  |  └─ Short Pulse Set (3)
| | |  └─ Antenna PPR (1)
| | └─ Magnetron type (2)
| └─ PRF sets selection (from 0 to 3)
└─R = request of status, S = save potentiometers as factory default
```

Notes:

(1) Set the number of antenna PPR, 4 digits zero padded: (0128, 0132, 1024, 4096)

(2) Magnetron Type :

MAGNETRON TYPE CODE	MAGNETRON TYPE MODEL
0	MG5494
1	M1492
2	MG5424/MG5230T/MG5231T/MG5222/MG5089T
3	MG4010
4	M1475A
5	M1302L/M1555
6	MSF1425A/MAF1565
7	M1311L
8	MG5223
9	M1458A
10	M1568A

(3) Short Pulse width, from 0 to F (maximum) in 10 ns steps. This is the nominal trigger pull.

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115

([4]) Set the Performance Monitor Unit installation status, “P” = present, NULL not present.

([5]) Main power status, Bit 0 set to 0 power supply at 24 volt

Bit 0 set to 1 power supply at 50 volt.

Bit 1 set to 1 HSC Antenna.

Bit 2 set to 1 Gear motor ratio 1:20.

Bit 3 set to 1 HL Falling front, 0 Rising front.

([6]) TXRX Type, Bit 0 set to 0 for Speed Control, 1 for Antenna fixed speed

WARNING

HSC ANTENNA AND GEAR MOTOR RATIO 1:20 CANNOT BE BOTH ACTIVE, A MESSAGE WITH SUCH CONFIGURATION WILL BE REFUSED.

3.7.2 **Data transmission from TXRX (o interfaces) to RDC**

3.7.2.1 Status sentence 2 – SRT Coldfire

$PST2,x,a,aa,aaa,a,a,a,a,a,hh,a,a,,a*hh<CR><LF

```
|| |  | | | | || | |||
|| |  | | | | || | || └ Protocol Version (Starting from A) (4)
|| |  | | | | || | | └ Empty Field
|| |  | | | | || | └ MGN Heater: W = warm, C = cold else NULL (N.A.)
|| |  | | | | || |  └ A = Automatic Tuning ON else NULL (OFF)
|| |  | | | | || └ Manual Tuning Adjust. If Automatic NULL (Don't care)
|| |  | | | | |└ P = Performance Monitor Available else NULL (N.A.)
|| |  | | | |  └ S = Service Mode A = Auto Adjust. else NULL (OFF)
|| |  | | |  └ W = Warm Up, R = Ready
|| |  | |  └ X = X-Band , S = S-Band Transceiver
|| |  |  └ J = Jitter ON else NULL (OFF)
|| |  └Rxx = Antenna Rotating ON with xx RPM ( 01 ÷ 60) else NULL (OFF)
|| └ Transceiver status (3)
| └ M = Acknowledge Master, S = Slave (2)
└ Transceiver Number (1)
```

Notes:

([1]) Transceiver Number: 1, 2, 3, 4 **(NIL in stand alone TXRX)**
([2]) Master/Slave acknowledge **(NIL in stand alone TXRX)**
([4]) to be used only for release a warning message.
([3]) Transceiver status:

FIELD TYPE	FIELD DESCRIPTIONS
SB	Standby
SH	Short pulse, High frequency
SM	Short pulse, Medium frequency
SL	Short pulse, Low frequency
MM	Medium pulse, Medium frequency
ML	Medium pulse, Low frequency
LL	Long pulse, Low frequency
SE	Short pulse, External trigger
ME	Medium pulse, External trigger
LE	Long pulse, External trigger

3.7.2.2 Data sentence – SRT Coldfire

$PDAT,hh,hh,hh,xxx,xx,xxx,x*hh<CR><LF>

```
      |  |  |  |  |  |  |
      |  |  |  |  |  |  |
      |  |  |  |  |  |  └── Software Revision (From A to Z)
      |  |  |  |  |  └── Warm Up time (²)
      |  |  |  |  └── Txrx Program Software Version (> 80)
      |  |  |  └── Inner transceiver temperature (¹)
      |  |  └── Magnetron Peak Current (Range 00H ÷ FFH).
      |  └── Main Bang Amplitude (Range 00H ÷ FFH).
      └── Power Level (Range 00H ÷ FFH).
```

Notes:

(¹) Transceiver temperature: From -99 to 99 Celsius degree (signed value).

(²) Warm Up time: calculated in seconds, when null becomes TXRX READY.

Value of **power level, main bang and magnetron peak current** during sector blanking are frozen.

3.7.2.3 Timers information – SRT Coldfire

$PTIM,c--c,x.x,x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,a*hh<CR><LF>

- Timers validity: **A** = valid **V** = invalid
- System timer **(4)**
- Timer M-Pulse Low Freq.
- Timer S-Pulse Low Freq.
- Timer S-Pulse Medium Freq.
- Timer L-Pulse Low Freq. **(3)**
- Timer M-Pulse Medium Freq.
- Timer S-Pulse High Freq.
- Timer Standby
- Status 3
- Status 2 **(2)**
- Status 1 **(1)**

Notes:

Status 1 **(1)** : Magnetron Type label

Status 2 **(2)** : Integer value indicating the magnetron end of life, from 0 to 999, > 100 mean end of life.

Status 3 : Spare

(3) Timers : Integer value indicating the operated time. LSB is equal to 1 hour.

(4) System : Integer value indicating lifetime of transceiver LSB is equal to 1 hour

When the trigger is sourced externally only the first three timers (SH/MM/LL) are incremented according the selected pulse. External PRF cannot be measured at this time so it is not fully correct from a lifetime perspective (es: external trigger PRF 750 Hz with short pulse).

3.7.2.4 Digital pot. information – SRT Coldfire

$PDPI,xx,xx,xx,xx,xx,xx,xx*hh<CR><LF>

```
      |  |  |  |  |  |  |
      |  |  |  |  |  |  └─ Pot ID #6, PM Noise diode current
      |  |  |  |  |  └──── Pot ID #5, Tuning Offset
      |  |  |  |  └─────── Pot ID #4, Tuning Indication
      |  |  |  └────────── Pot ID #3, PM Distance (Power level)
      |  |  └───────────── Pot ID #2, Performance Monitor Open
      |  └──────────────── Pot ID #1, PRE-STC Slope
      └─────────────────── Pot ID #0, PRE-STC Amplitude
```

Notes:

Potentiometer decimal Value : Range 0 ÷ 99.

3.7.2.5 Sector blanking sentence – SRT Coldfire

$PSEC,,hhhh,hhhh,hhhh,hhhh,xxxx*hh<CR><LF>

```
      |     |     |     |     |
      |     |     |     |     └─ Antenna data (²)
      |     |     |     └─ End Sector 2
      |     |     └─ Start Sector 2
      |     └─ End Sector 1
      └─ Start Sector 1
```

Notes:

(¹) Start & End Sector are calculated as previous documentation

(²) Indicates the number of antenna PPR, 4 digits zero padded: (0128, 0132, 1024, 4096)

$PSE2,,x.x,x.x,x.x,x.x*hh<CR><LF>

```
      |  |  |  |
      |  |  |  └─ End Sector 2
      |  |  └─ Start Sector 2
      |  └─ End Sector 1
      └─ Start Sector 1
```

Notes:

Start & End Sector units are integer degree. Es: 90, 123, 1

3.7.2.6 Configuration status – SRT Coldfire

$PCFG,,x,xx,xxxx,h,hhhh,a,h,hhhh*hh<CR><LF>

```
| |   |  |   | | |  |
| |   |  |   | | |  |
| |   |  |   | | |  └─ Optional parameters. 12 bits in hex format (7)
| |   |  |   | | └─ Configuration. 4 bits in hex format.(6)
| |   |  |   | └─ Performance monitor available.(5)
| |   |  |   └─ CRC program. 16 bits in hex format.(4)
| |   |  └─ Short Pulse Set (3)
| |   └─ Antenna PPR (1)
| └─ Magnetron type (2)
└─ PRF sets selection (from 0 to 3)
```

Notes:

(1) Set the number of antenna PPR, 4 digits zero padded: (0128, 0132, 1024, 4096)

(2) Magnetron Type :

MAGNETRON TYPE CODE	MAGNETRON TYPE MODEL
0	MG5494
1	M1492
2	MG5424/MG5494/MG5230T/MG5231T/MG5222/MG5089T
3	MG4010
4	M1475A
5	M1302L/M1555
6	MSF1425A/MAF1565
7	M1311L
8	MG5223
9	M1458A
10	M1568A

(3) Short Pulse width, from 0 to F (maximum) in 5 ns steps. This is the nominal pulse length (ns)for the 25 KW S-Band transceiver.

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115

([4]) Show CRC program in hex value.

([5]) Show the Performance Monitor Unit installation status, “P” = present, NULL not present.

([6]) Main power status, Bit 0 set to 0 power supply at 24 volt

Bit 0 set to 1 power supply at 50 volt.

Bit 1 set to 1 HSC Antenna.

Bit 2 set to 1 Gear motor ratio 1:20.

Bit 3 set to 1 HL Falling front, 0 Rising front.

([7]) TXRX Type, Bit 0 set to 0 for Speed Control, 1 for Antenna fixed speed

3.7.2.7 Not acknowledge command (NACK) – SRT Coldfire

$PNAC,x,aaa,xx,xx*hh<CR><LF>

```
        |  |  |  |
        |  |  |  └─ Wrong field (³)
        |  |  └─ Error Code (²)
        |  └─ Refused Sentence (if recognized) (¹)
        └─ Transceiver Number (as sentence STS or NULL in stand alone TX/RX )
```

Notes:

(¹) See list of accepted sentences

(²) Numeric value, from 0 to 99, command dependent (see list below)

(³) Field number. Incremental from 1 after sentence code.

Es. 1: **$PNAC,2,COP,01,05*hh<CR><LF>**

Meaning: feedback on error inside COP command for transceiver 2 through TXRX Interface, error type #01, field #05 (wrong JITTER field)

Es. 2: **$PNAC,,COP,01,37*hh<CR><LF>**

Meaning: same feedback error directly from TXRX

3.7.2.8 Health sentence 2 – SRT Coldfire

$PHT2,a,a,a,a,a,a,a,a,a,a,a,a,a,a*hh<CR><LF>

```
| || | || | | || | ||  |
| || | || | | || | ||  └── External trigger. Test: A = Matches with select pulse width
| || | || | | || | || V = Pulse width invalid no transmission
| || | || | | || | |└── MOK. test: A = Motor Current nominal
| || | || | | || | | V = Motor Current Protection ant. STOP.
| || | || | | || | └── TEMP. test: A = Temperature < 85 degree.
| || | || | | || | V = Temperature > 85 degree ant. STOP.
| || | || | | || └── INTERLOCK test : A = Transceiver safety door CLOSED
| || | || | | || V = Transceiver safety door OPEN
| || | || | | |└── FE MONITOR test : A = Front End OK
| || | || | | | V = Front End Fail
| || | || | | └── -15VDC Voltage test : A = Test valid (value in range)
| || | || | | V = Test invalid (value out of range)
| || | || | |
| || | || | └── 15ISO Voltage test : A = Test valid (value in range)
| || | || | V = Test invalid (voltage out of range)
| || | || └─── +15 VDC Voltage test : A = Test valid (value in range)
| || | || V = Test invalid (voltage out of range)
| || | |└── Line Input (24/50v, Voltage test : A = Test valid (value in range)
| || | | V = Test invalid (voltage out of range)
| || | └── LINK flag (³)
| || └── CRC ERROR RECEPTION (²)
| |└── Safety Controls : A = Test valid ( safety sw. close )
| | V = Test invalid (safety sw. open) (¹)
| └── Magnetron Heater, Voltage test : A = Test valid (value in range)
| V = Test invalid (voltage out of range)
└── +24 VCO, Voltage test : A = Test valid (value in range)
V = Test invalid (voltage out of range)
```

Notes:

LINK flag: Valid if Rx data are received.

Invalid if Rx data are NOT received. (time-out)

CRC ER: Invalid each time a crc error in Rx data will be found.

3.7.2.9 Data sentence 3 – SRT Coldfire

$PDT3,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,hhhh*hh<CR><LF>

```
      |  |  |  |  |  |  |  |
      |  |  |  |  |  |  |  └─ Prog. Config. 16 bits in hex format (Not in use)
      |  |  |  |  |  |  └─ +5VDC Voltage
      |  |  |  |  |  └─ -5VDC Voltage
      |  |  |  |  └─ -15VDC Voltage
      |  |  |  └─ Line Voltage +24 / 50 VDC
      |  |  └─ +15 VDC Voltage
      |  └─ +24 VCO VDC Voltage
      └─ Heater Voltage
```

Each value of voltage is integer and millivolt.

3.7.2.10 Accelerometers – SRT Coldfire

$PACC,x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,*hh<CR><LF>

```
      |  |  |  |  |  |  |
      |  |  |  |  |  |  |
      |  |  |  |  |  |  └─ Z Peak acceleration
      |  |  |  |  |  └─ Y Peak acceleration
      |  |  |  |  └─ X Peak acceleration
      |  |  |  └─ Z Average
      |  |  └─ Y Average
      |  └─ X Average
      └─ 0 = PCB accelerometer, 1 = External accelerometer
```

Peak/Average Acceleration is an integer value in mg (max 16000=16g) measured in one PACC transmission time.

3.7.2.11 Request generic data – SRT Coldfire

$PRGD,a,a,a,hh*hh<CR><LF>

```
      |  |  |  |
      |  |  |  |
      |  |  |  └─ Data packet in hex code 32 bytes MSB first
      |  |  └─ sentence number
      |  └─ total number of sentences
      └─ Request code
```

3.7.2.12 Trigger delay and pretrigger length – SRT Coldfire

$PDLY,xx,xx*hh<CR><LF>

```
      |  |
      |  |
      |  └─ Pretrigger length in 10ns units. Max value is 511 (5.12 usec)
      └─ Trigger Advance Delay in 20ns units
```

3.7.3 General notes

Rates:

*Data transmission rate to **TXRX** should be:*

Sentence **CO2** 1 Hz normally, or when is necessary

Sentence **SE2** when is necessary upgrade Sector Blanking

Sentence **TIM** every time is necessary timers information or reset values

Sentence **DPC** every time is necessary digital potentiometer information or value upgrade

Sentence **CFG** only for first setup

Sentence **SPD** only for first setup and when the motor controller is changed

Rate shall be not faster than 50ms between two consecutive sentences.

*Data transmission rate from **TXRX** are:*

Sentence **ST2** 1 Hz normally

Sentence **DAT** connection depending : 1 Hz (Interfaces) or 150ms (TXRX).

Sentences **DPI, SE2** on request

Sentences **TIM,** on request and each 30 minutes of interval after power on.

Sentence **NAC** when necessary

Sentences **HT2** 1 Hz normally

Sentences **DT3** 1 Hz normally

Sentences **PACC** every 20 secs

Sentences **CFG** on request.

Sentences **SPD** on request.

Sentences **RGD** on request.

Error Code:

MESSAGE	ERROR CODE	MEANING
COP	00	CRC ERROR
CO2	01	Field not in compliance with specification
	02	Missing transceiver control
SE2	00	CRC ERROR
	01	Field not in compliance with specification
	02	Wrong sector value
TIM	00	CRC ERROR
	01	Field not in compliance with specification
	02	Missing command type
	03	Initialization value outside limits
DPC	00	CRC ERROR
	01	Field not in compliance with specification
	02	Wrong potentiometer ID
	03	Potentiometer value outside limits
CFG	00	CRC ERROR
	01	Field not in compliance with specification
SPD	00	CRC ERROR
	01	Field not in compliance with specification
REQ	00	CRC ERROR
	01	Field not in compliance with specification
DLY	00	CRC ERROR
	01	Trigger field not in compliance with specification
	02	Pretrigger field not in compliance with specification

CHAPTER 4
FUNCTIONAL DESCRIPTION

4.1 INTRODUCTION

The present chapter provides the functional and detailed description of the main functions and operation performed by the SRT S-Band Up Mast.

The descriptions are structured in paragraphs as described below:

- Paragraph 4.2 - Functional description provides a general functional description, functional areas identification and main interconnections among them. This allows highlighting the relationship and unit performance of the main functions. As a functional area it is intended a group of circuits, or other devices, which operate together to accomplish a well defined function.
- Paragraph 4.3 - Electronic BOARD
- Paragraph 4.4 - Electrical diagrams of the BOARDs in SRT S-Band Up Mast
- Paragraph 4.5 - RF HEAD
- Paragraph 4.6 - Motor group
- Paragraph 4.7 - Additional components
- Paragraph 4.8 - Performance Monitor

4.2 FUNCTIONAL DESCRIPTION

The SRT S-Band Up Mast is a transceiver that internally contains all the technology for:

1) Transmitting the R.F pulses within the specified vertical and horizontal lobes with horizontal polarization through the antenna.
2) Receiving the reflected R.F. echoes and, after internal processing, send them to the console.
3) Analysing and processing the signals received tank to the RF head and the electronic part and successively sending them to the console.

The SRT S-Band Up Mast, inside, can be subdivided into three main parts:

- Electronic BOARD (Electronic parts) described in paragraph 4.3 – Electronic BOARD
- Radio frequencies (RF parts) described in Table 8.2.2 - RF Parts
- Motor Group described in 4.6 - Motor group

The SRT S-Band Up Mast is connected to a console by Harting connector to which is connected a single cable through which the signals pass that are necessary to control it and the feed cables.

Opening the cover of the SRT S-Band Up Mast on the motor side (Paragraph 7.5 - Fig. 1.1.26) there is the small SPINT electronic board from which the feed cables branch off to the Brushless Controller and the SRT PWR-DC and a direct video cable to the SRT CONTROL, utilised for the communication of the signals.The most important BOARD of the SRT S-Band Up Mast is the SRT PWR-DC. It

supplies the voltages to feed the functioning of the other two electronic BOARD positioned at the side of it which are the SRT CONTROL and the SRT MOS.

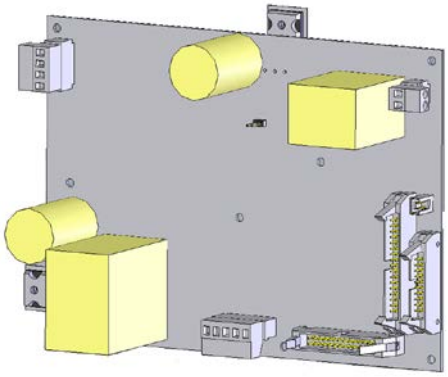
The SRT MOS generates voltages that feed another important SRT S-Band Up Mast element, the Magnetron, which is the first component of the RF parts, which starts generating radio wave pulses at a certain frequency (in the case of this manual, it refers to a SRT S-Band Up Mast of 2900 MHz ÷ 3100 MHz) that sends by a coaxial cable to the antenna. Inside the SRT S-Band Up Mast there is a mechanical parts, denoted as Motor Group, that permit the antenna to rotate, controlled and powered to Brushless controller. The latter component is controlled by SRT CONTROL BOARD. The antenna that is fixed at the top of the machine sends the pulses and captures the relative responses. These signals pass through a circulator that permits the frequencies sent out to come back correctly. At the side of it is the limiter that limits the part entering so as not to burn out the LNFE (Low Noise Front End) instrument that identifies the start and the end of the pulses. This is connected to the RF Detector (Radio Frequency Detector) that analyses the power of the pulses and the tuning to send it to the SRT CONTROL that processes the data.

The SRT S-Band Up Mast is positioned in the highest area of the ship. In the area below is a safety switch that disconnects the SRT S-Band Up Mast system completely from the power supply.

4.3 **ELECTRONIC BOARD**

The function of the four electronic BOARDs that constitute the communication, translation and processing of signals that pass between the antenna and the console is described in this paragraph.

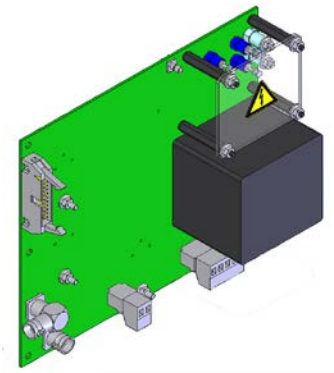
4.3.1 **SRT POWER (SRT PWR-DC)**



1.1.4 *SRT PWR-DC*

Opening the cover on the boards' side of the SRT S-Band Up Mast (Paragraph 7.5 - Fig. 1.1.26), SRT PWR-DC is located to the right (refer to the figure in chapter 7), behind SRT MOS and SRT CONTROL and therefore hidden from view. Its function is to generate the voltage necessary for the other parts of the apparatus. It is fed at 50 V (refer to paragraph 4.6).

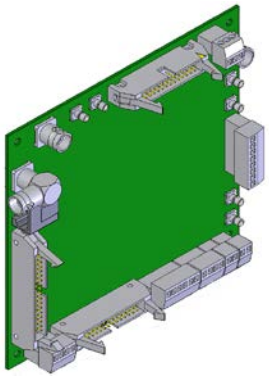
4.3.2 **SRT MOS**



1.1.5 *SRT MOS*

Opening the cover on the boards' side of the SRT S-Band Up Mast, SRT MOS is located above SRT CONTROL. Its main function is to generate the pulses and voltages that are sent to the Magnetron.

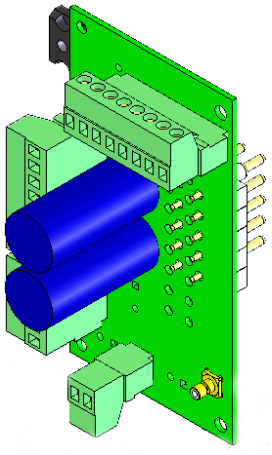
4.3.3 **SRT CONTROL**



1.1.6 *SRT CONTROL*

Opening the cover on the boards' side of the SRT S-Band Up Mast (Paragraph 7.5 - Fig. 1.1.26), SRT CONTROL is located underneath SRT MOS on the left part of the apparatus. The SRT CONTROL BOARD houses the processor and the SPGA that have pre-installed programs, that are the intelligence of the SRT S-Band Up Mast and are capable of carrying out all useful processing for the transmitter and therefore also for the SRT MOS (generation of trigger, timing, test signals and alarms) by processing the signal received from the antenna. Its function is to control the functioning of the transmitter and signal any fault alarms to the console. As well as the control of the timing, SRT CONTROL also generates signals that interact with the RF Detector, the first RF element which processes input data to be delivered to the SRT CONTROL (video, tuning, monitor signals, etc.). This BOARD must be programmed only by technicians. For it to function, five voltages are necessary: +5 V, -5 V, +15 V, -15 V and +24 V.

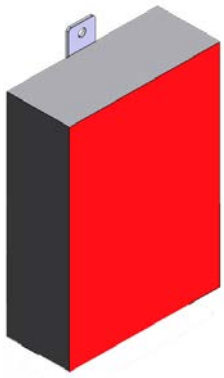
4.3.4 **SPINT**



1.1.7 *SPINT*

Located inside SRT S-Band Up Mast, the SPINT electronic board allows signals that arrive from the external cable to be distributed to the various elements inside the machine (refer to paragraph 4.2 - Functional description).

4.3.5 **Brushless controller**



1.1.8 *Brushless controller*

Situated on the motor side (Paragraph 7.5 - Fig. 1.1.26), the Brushless controller is fed by cables coming from the SPINT board. Its purpose is to control the brushless motor on the basis of information received by the SRT CONTROL board.

4.3.5.1 Luminous indicators and protections on the Brushless Controller

The protections are all visualised by the LEDs on the front of the converter. Furthermore, it is equipped with a series of protections to safeguard the converter and the connected motor in case of malfunction.

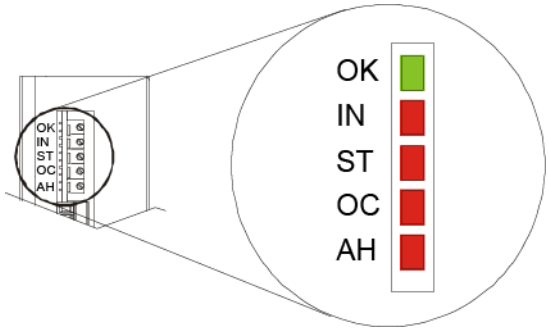


Table 4.3.1 The LED functions on the Brushless controller

LED	FUNCTION
OK (green)	Normally ON. It signals the correct functioning of the equipment. It switches off in the event of any anomaly “except for the intervention of the nominal current” and for the Min/Max voltage protection intervention (reversible alarm).
IN (red)	Normally OFF. In the event of switching on, it indicates that the limit set of the nominal current of the motor has been exceeded (reversible alarm).
ST (red)	Normally OFF. It visualises when the maximum temperature set of the dissipator has been reached. The intervention causes the converter to block and the memorisation of the alarm. The alarm can be reset when the dissipator has cooled down. Switch off and then switch back on the power supply to reset the function.
OC (red)	Normally OFF. This signal could occur due to a short circuit between the terminals of the motor or a short circuit of an output towards Earth. The intervention causes the converter to block and the memorisation of the alarm. Switch off the power supply, eliminate the cause and switch back on the power supply.
AH (red)	Normally OFF. The alarm is visualised due to the lack of a Hall signal or for the lack of a power supply to the Hall cells. The intervention causes the converter to block and the memorisation of the alarm.

The protections are of two types: reversible and irreversible.

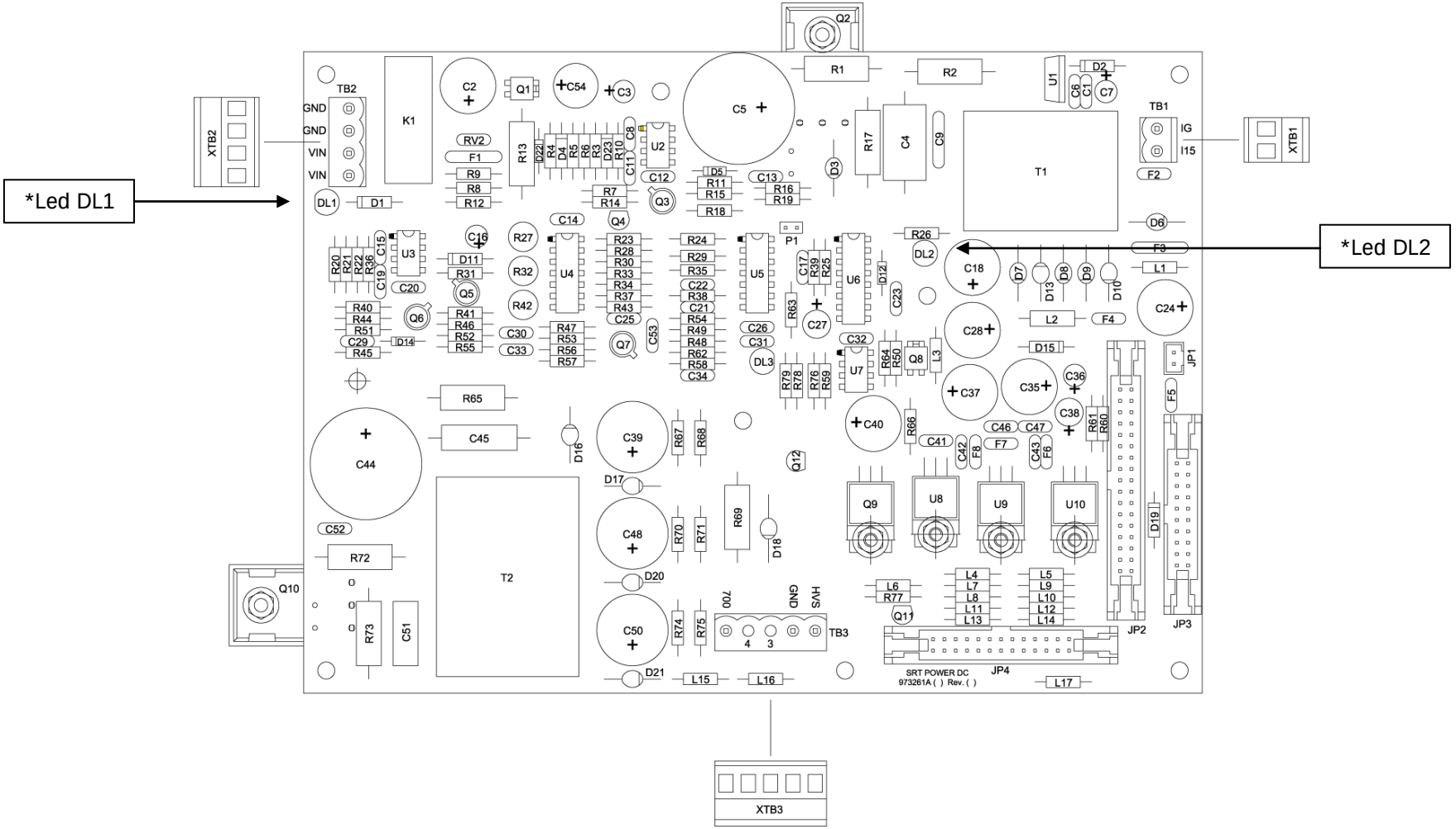
- ***Intervention of reversible protections***: Green LED **OK** and Red LED **IN**

  The converter is re-enabled automatically when the cause of the intervention has been corrected.

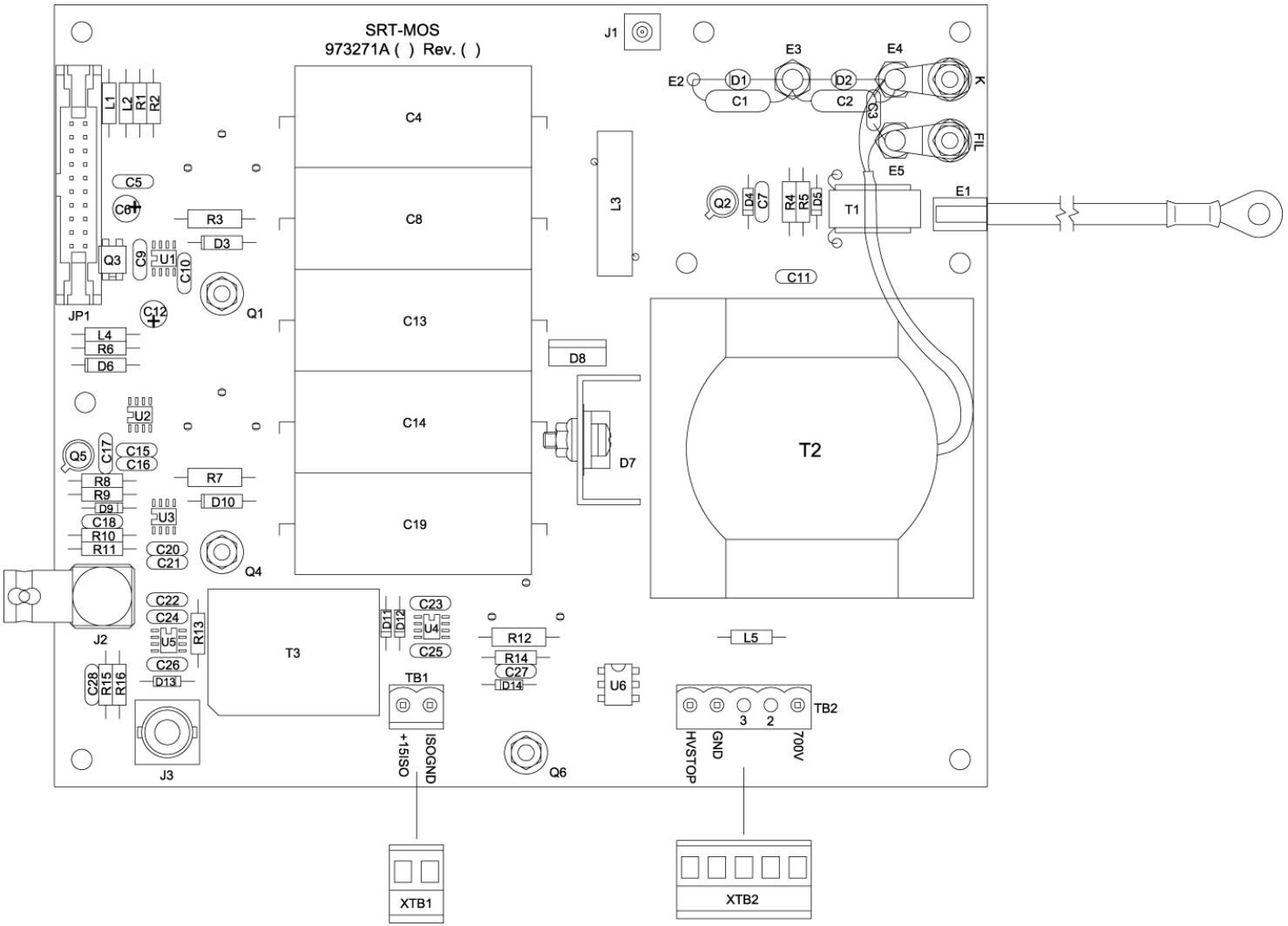
- ***Intervention of irreversible protections***: Red LEDs **ST**, **OC** and **AH**

  The converter is not re-enabled. The power supply must be disconnected, the cause eliminated that has caused the block and then switch off and switch back on the converter.

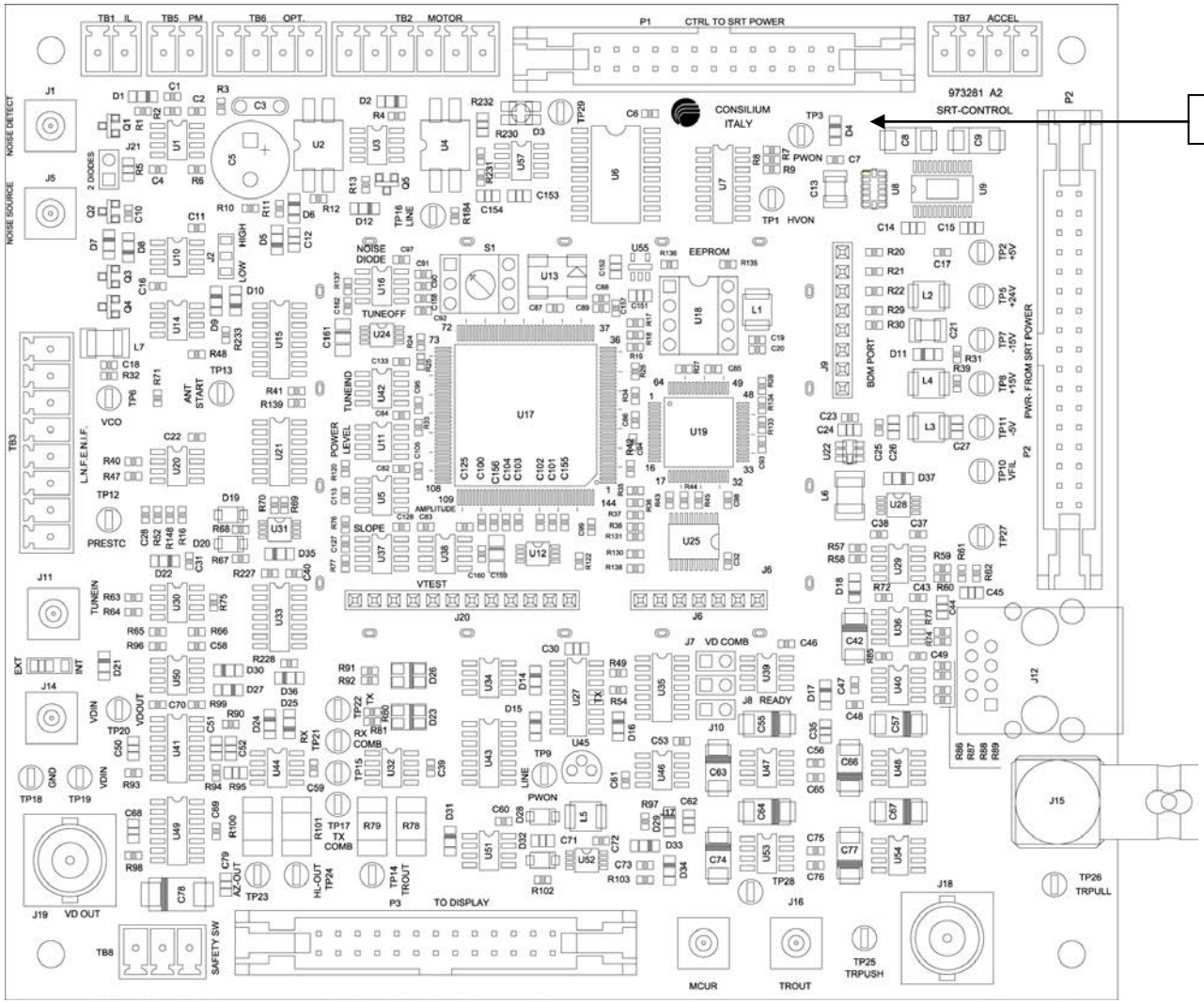
4.4 ELECTRICAL DIAGRAMS OF THE BOARDS IN SRT S-BAND UP MAST



1.1.9 *SRT PWR-DC*


SRT-MOS
973271A ( ) Rev. ( )
J1
E2
E3
E4
K
FIL
E5
E1
D1
D2
C1
C2
C3
Q2
D4
C7
R4
R5
D5
T1
C4
C8
C13
C14
C19
L3
C11
T2
D8
D7
JP1
L4
R6
D6
C12
Q1
U2
Q5
C17
C15
C16
R8
R9
D9
C18
R10
R11
U3
C20
C21
Q4
R7
D10
C5
C6
R3
D3
Q3
C9
U1
C10
L1
L2
R1
R2
J2
C22
C24
U5
R13
C26
D13
C28
R15
R16
J3
T3
C23
D11
D12
U4
C25
TB1
+15ISO
ISOGND
R12
R14
C27
D14
Q6
U6
L5
TB2
3
2
HVSTOP
GND
700V
XTB1
XTB2

1.1.10 *SRT MOS*



1.1.11 *SRT CONTROL*

4.5 **RF HEAD**

The RF HEAD is designed to generate RF pulses in the S-Band range and to receive echo from targets.

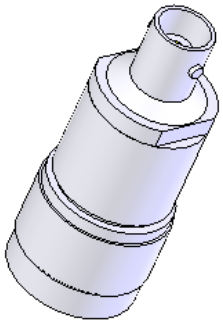
The RF HEAD is composed of a solid state controller Magnetron stage connected to a Circulator and ending with a flange to be connected to a waveguide in order to transfer the RF pulse to the Antenna for it to be radiated. In this apparatus, there is also a Band Pass Filter included between the magnetron and the circulator to filter out spurious frequency emissions.

The RF part of SRT S-Band Up Mast is composed of:

- A noise diode
- The magnetron
- The circulator
- The limiter
- LNFE + the RF Detector

These elements are explained as follows:

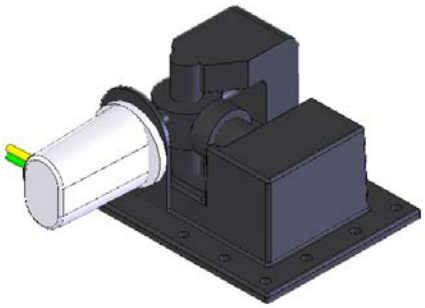
4.5.1 **Noise diode**



1.1.12 *Noise diode*

This diode is utilised to evaluate the performance of the radar. In fact, its function is to generate a ring of noise on the radar video monitor to evaluate the performance. The characteristics of this ring can be modified from the console and can even be made to disappear (therefore not described in this manual).

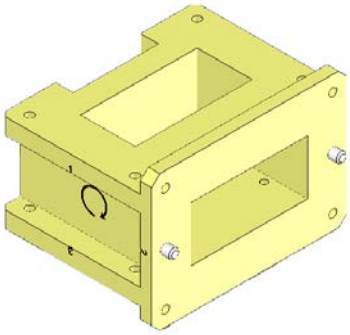
4.5.2 **Magnetron**



1.1.13 *Magnetron*

Magnetron is the main component of the RF HEAD part of SRT S-Band Up Mast. Its function is to generate radio frequency pulses determined by the voltages received from the SRT MOS BOARD. These pulses have an established frequency and being a SRT S-Band Up Mast they can vary between 2900 MHz ÷ 3100 MHz and through the antenna are emitted externally.

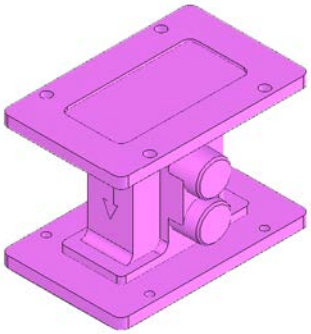
4.5.3 **Circulator**



1.1.14 *Circulator*

The circulator permits the output and input signals to travel correctly without being influenced and therefore generate errors.

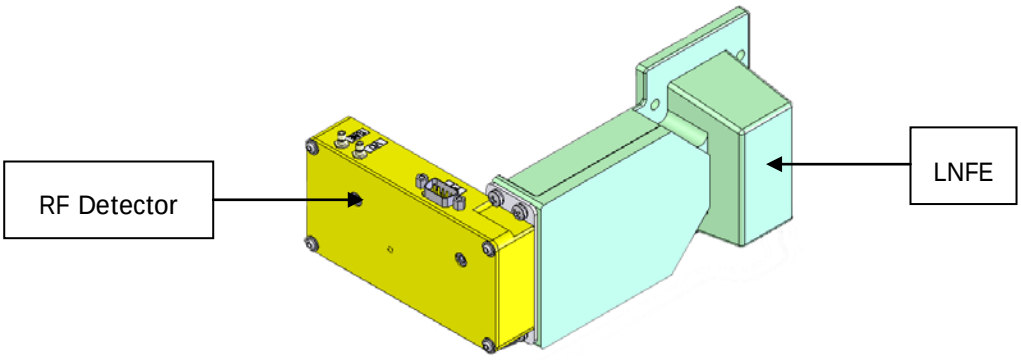
4.5.4 **Limiter**



1.1.15 *Limiter*

The limiter ensures that the LNFE is not burnt out and therefore suffer damage. At normal levels it has a normal impedance, but when the power is increased the impedance is also increased, a factor that protects the other apparatuses.

4.5.5 **LNFE & RF Detector**



1.1.16 *LNFE and the RF Detector*

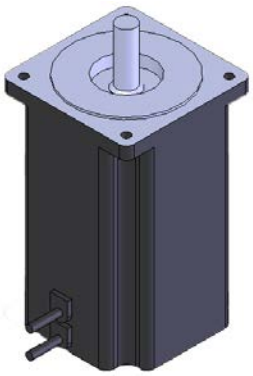
The LNFE (Low Noise Front End) is the instrument utilised to detect the start and the end of the various signals sent and the responses received so that useful data can be supplied and analysed by the RF Detector.

The RF Detector, the last instrument in the RF HEAD, interfaces with the SRT CONTROL. It amplifies the signals and generates data to activate the processes of the above-mentioned BOARD (such as Tuning, Video, Monitor signals).

4.6 **MOTOR GROUP**

This paragraph lists and describes the various mechanical components inside the SRT S-Band Up Mast that are utilised in the movement of the antenna.

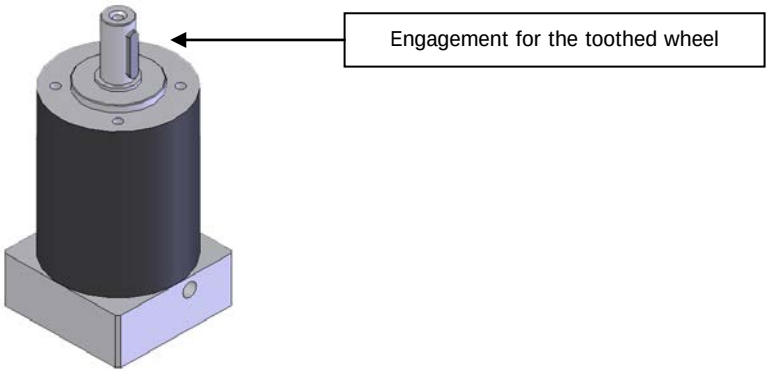
4.6.1 **Brushless motor**



1.1.17 *Brushless Motor*

Situated on the MOTOR SIDE cover (Paragraph 7.5 - Fig. 1.1.26), the Brushless Motor receives the amount of electrical power required from the Brushless controller. The rotating speed of the antenna can be varied by the user in the modes foreseen by the installed operating system. This value is converted by the SRT CONTROL board into a signal and then sent to the Brushless controller and then as voltage to the final component that is the motor.

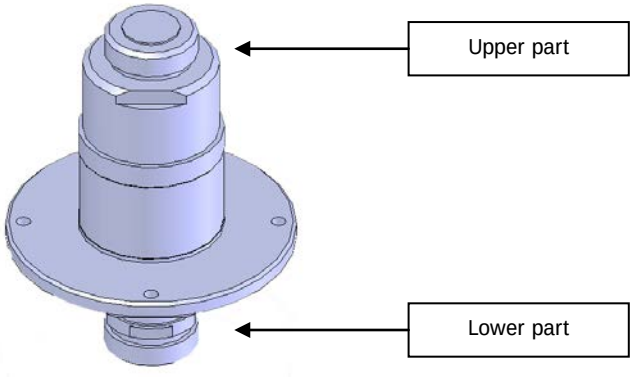
4.6.2 **Reducer**



1.1.18 *Reducer*

Situated on the cover side of the motor (Paragraph 7.5 - Fig. 1.1.26) above the motor, the reducer represents the connecting element between the mechanical part and the structure. Its function is to reduce, on the basis of the reduction ratio, the number of revolutions that it transmits to the motor and transfers the new movement to a toothed wheel (positioned in the upper part of the figure).

4.6.3 **Rotating joint**



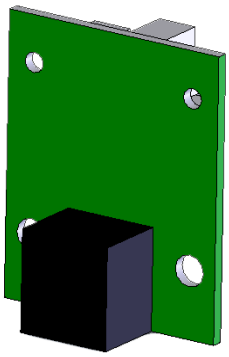
1.1.19 *Rotating joint*

Located underneath the antenna, the rotating joint represents the electro-mechanical element that connects the transceiver (positioned inside the antenna) with the components inside the SRT S-Band Up Mast that generate and receive impulses. To it are attached two coaxial cables:

- The first is connected in the lower part and housed inside the apparatus connecting the rotating joint with the RF HEAD.
- The second is connected in the upper part and is housed outside the apparatus connecting the rotating joint with the antenna.

4.7 ADDITIONAL COMPONENTS

4.7.1 Bearing Reader Board

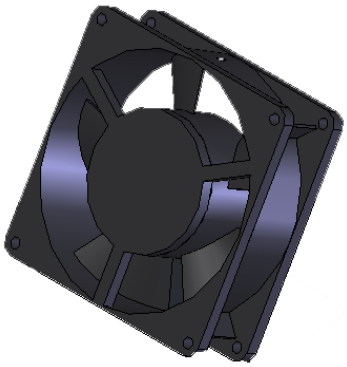


1.1.20 *Bearing Reader Board*

The Bearing Reader Board mounted on the cover side of the board (Paragraph 7.5 - Fig. 1.1.26).

This rotation is finally recorded by the Bearing Reader board that supplies important data, such as the position of the antenna at any moment.

4.7.2 Fan (only for the HSC system)



1.1.21 *Fan*

A fan is available in the HSC (High Speed Craft – 40 rpm approx.) systems. Situated on the cover side of the motor (Paragraph 7.5 - Fig. 1.1.26), connected to the SRT POWER board. It is fed only if the temperature exceeds 55°C inside the SRT S-Band Up Mast.

4.7.3 HEATER Kit (optional)

The HEATER Kit is installed inside the SRT S-Band Up Mast to heat the apparatus when and if the external temperature drops below 0°C which could prejudice the correct functioning of the apparatus.

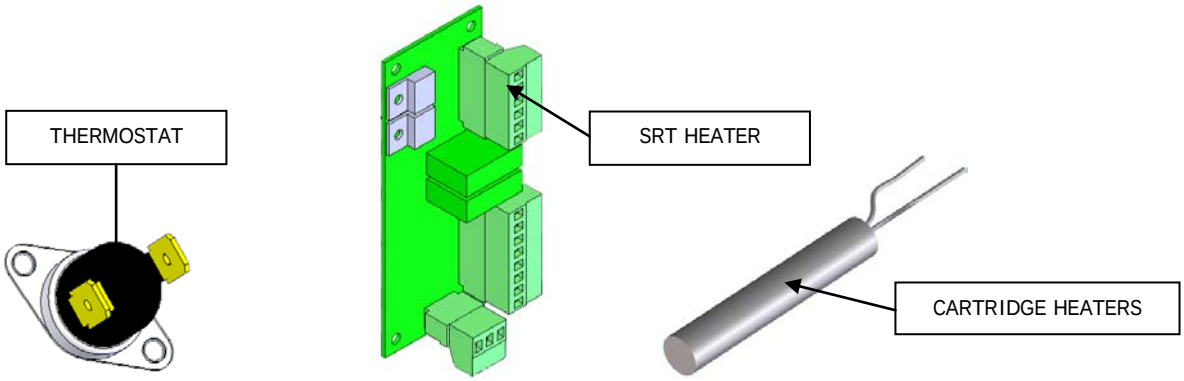
It is composed of:

- A control board (SRT HEATER BOARD)
- A thermostat
- Two cartridge heaters

The various parts that the kit is composed of are shown in Fig. 1.1.23. The functioning principle is the

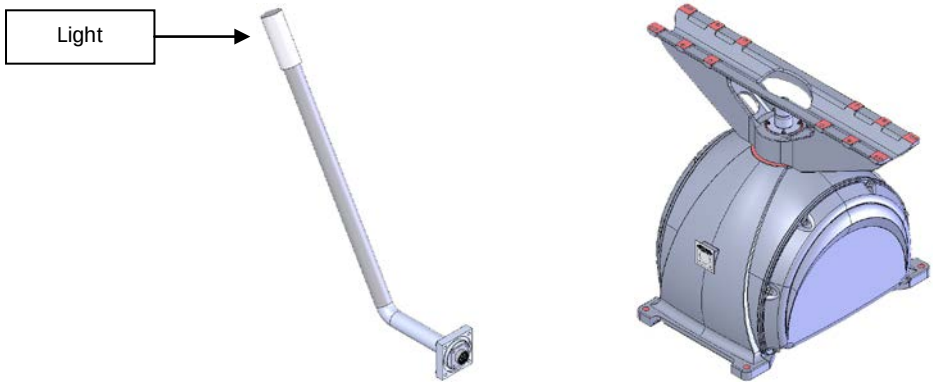
following:

The SRT HEATER BOARD that can be seen from the motor side plug is situated by the side of the SRT POWER unit. It is fed by the Brushless Controller (refer to paragraph 9.2.4). It is connected to the thermostat and the SRT CONTROL unit. When the thermostat records a temperature below 0°C it sends a signal to the SRT HEATER unit which then sends voltage to the cartridge heaters. When the heaters reach approx. 200°C they transmit the heat to the SRT S-Band Up Mast structure. By doing this the internal temperature of the apparatus is maintained at 0°C.



1.1.22 *SRT HEATER KIT*

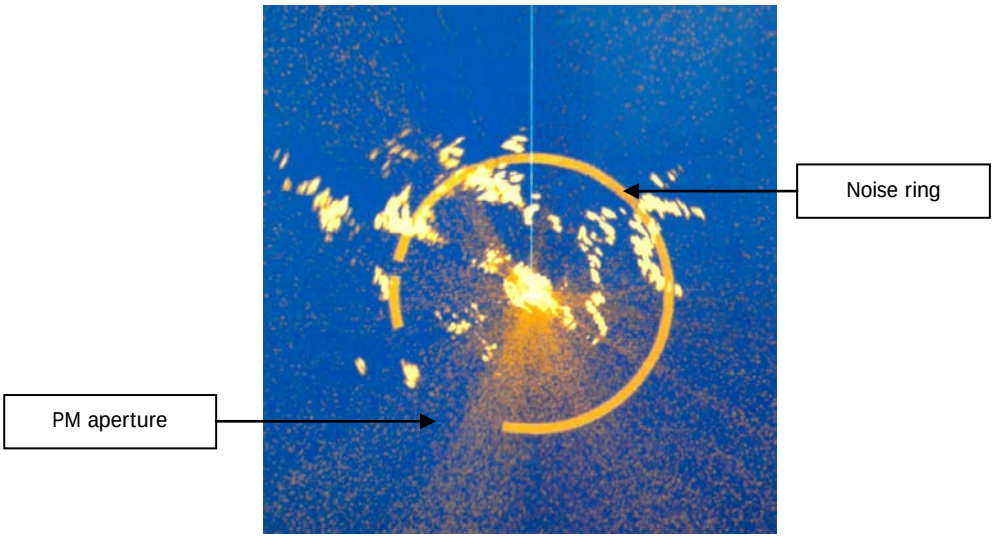
4.8 PERFORMANCE MONITOR



1.1.23 *Performance Monitor*

Positioned outside of the apparatus, the Performance Monitor is installed on the side of the SRT S-Band Up Mast (Paragraph 4.8 - Fig.1.1.24). The purpose of this element is to supply information to the user that utilises the radar apparatus and therefore also a verification of the correct transmission. On the basis of the console to which the SRT S-Band Up Mast is connected, a ring can be visualised on the monitor that is of variable width depending on the entered parameters generated by the noise diode in the SRT S-Band Up Mast. If the apparatus is functioning correctly, this ring represents a missing sector (refer to Fig. 1.1.24). This obscuring is caused by the light installed on the Performance Monitor. This light, at the

moment in which it is crossed by the radar beam produces a luminous radiation (also visible to the eye) that produces a break-up of the ring on the monitor. In synthesis, it can be affirmed that if the transmission occurs correctly there is a discontinuous ring (refer to Fig. 1.1.24). If the transmission does not occur correctly, the ring is closed.



1.1.24 *Viewer of Performance Monitor*

CHAPTER 5
PREVENTIVE MAINTENANCE

5.1 INTRODUCTION

This chapter provides the necessary information to execute the preventive maintenance operations which must be carried out in order to ensure the SRT S-Band Up Mast's full efficiency.

The maintenance procedures are described in tabular form (Card); each card lists the operation which must be performed, the periodicity, the personnel required, the materials and the time required for the performance.

5.2 PREVENTIVE MAINTENANCE PROCEDURE

The preventive Maintenance procedures are given by means of BOARD. Each card, besides indicating the operation to be performed during the maintenance execution, lists the following indications:

- **PERIODICITY**: it is an alphanumeric code to identifying the maintenance action described. The following periodicity symbols, as appropriate, are used in the order of increasing periodicity interval as listed in the following:
  - . M: Monthly
  - . S: Semi-annual
  - . A: Annually
  - . WR: When Required.
- **PERSONNEL**: it indicates the number and the typology of the personnel able to perform the maintenance operation; by making the assumption that the qualification, knowledge, experience and skill needed to fulfill the task assigned are proportional to the ranks. The following abbreviations are used:
  - . ST: is a qualified person with not less than ten years of experience on the job
  - . JT: is a qualified person with more than four years of experience on the job
  - . R: is a young technician with less than four years of experience on the job, he can be either qualified or undergoing qualification.
- **REQUIRED INSTRUMENTS**: it indicates the tools or the instruments which are used in the card operations.
- **REQUIRED TIME**: it indicates the total time required to perform the card operation.
- **SAFETY PRECAUTIONS**: it indicates the precaution to be followed in order to ensure a safe execution of the Preventive Maintenance operation.

Table 5.2.1 List of Preventive Maintenance BOARD

OPERATION	PERIODICITY	REQUIRED TIME
Check of the External Preservation Status	S1	15 min.
Internal Inspection and General Cleaning	S2	15 min.

WARNING

HIGH VOLTAGE IS PRESENT INSIDE THE UNIT. DO NOT OPEN THE CABINET COVER BEFORE THE MAIN LINE BREAKER HAS BEEN TURNED TO OFF POSITION. ALL WORK PERFORMED ON THE TXRX MUST BE RECORDED IN THE UNIT LOG BOOK.

WARNING

BEFORE STARTING ANY MAINTENANCE WORK, IT IS MANDATORY THAT, FOR THE SAFETY OF PERSONNEL, ALL HIGH-VOLTAGE CAPACITORS BE SHORT-CIRCUITED BY MEANS OF A WELL INSULATED SCREWDRIVER OR OTHER SUITABLE TOOL. BEFORE CONNECTING INSTRUMENTATION USED FOR PERFORMING MEASUREMENTS INSIDE THE UNIT, IT IS ADVISABLE TO SWITCH OFF THE POWER SUPPLY. DO NOT ALTER THE SETTING OF THE SEMIOPERATIVE CONTROLS UNLESS A SPECIFIC ADJUSTAMENT IS REQUIRED AND THE NECESSARY TEST EQUIPMENT IS AVAILABLE

CARD 1

UNIT	OPERATION	PERIODICITY
SRT S-Band Up Mast	Check of external preservation status	S1
PERSONNEL	**REQUIRED INSTRUMENTS**	**REQUIRED TIME**
1R	None	15 minutes

SAFETY PRECAUTIONS

On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

STEP	SEQUENCE OF OPERATIONS
1.	Check that no part of the plastic covering the Antenna has been painted.
2.	Check the casing preservation state.
3.	Unscrew and grease the 4 fastening screws of the cover (Chapter 7, 0 - 7.5.1 - Disassembly of the inspection covers of the SRT S-Band Up Mast) to avoid corrosion and facilitate future inspections.
4.	If paint has been scratched off at any point, proceed as follows: - Carefully degrease the part to be painted - Smoothen the surface lightly with emery paper - Clean with dry brush - Apply a coat of anticorrosive - When the applied anticorrosive is dry, paint with a brush or, better still, by spraying
5.	On the electric switchboard, set the power breaker relevant to the unit to ON and remove the warning placard.

CARD 2

UNIT	OPERATION	PERIODICITY
SRT S-Band Up Mast	Internal inspection and general cleaning	S2
PERSONNEL	**REQUIRED INSTRUMENTS**	**REQUIRED TIME**
1R	Set of screwdrivers, Electro Contact Cleaner, Soft brush, Primer, Paint, Emery paper, Soft cloth.	15 minutes

SAFETY PRECAUTIONS

On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON"

STEP	SEQUENCE OF OPERATIONS
	Preliminary Operation
1.	Unscrew and grease the 4 fastening screws of the cover (Chapter 7, 0 - 7.5.1 - Disassembly of the inspection covers of the SRT S-Band Up Mast) and open the former.
	Internal Multipin Connectors and Cables Inspection
2.	Check the condition of each connector's electric contacts (pins and covers), connector packing and its cable. Clean contacts by using Electro Contact Cleaner. Repair or replace, if necessary, any defective parts.
	General Cleaning
3.	By using a soft brush and alcohol, remove dust, ash and grease from the internal components.
4.	Dry the surface by using a soft cloth.
	Final Operation
5.	Close the equipment cover by following the reverse procedure.
6.	Grease the fastening screws to avoid corrosion and facilitate future inspections and fix the cover.
7.	On the electric switchboard, set the power breaker relevant to the unit to ON and remove the warning placard.

5.3 **LIFE TIME COMPONENTS**

Table 5.3.1 List of Lifetime of SRT Transceiver

POS.	DESCRIPTION		DRAWING SPECIFICATION NUMBER OR TYPE	REQUIRED QUANTITY (N)	LIFETIME (K Hours)
1 A	M1458A	S-Band Magnetron	89A505P020	1	7*

**Estimated, depending of use*

WARNING

ALL THE COMPONENTS INDICATED IN THE TABLE SHALL BE REPLACED BEFORE THE EXPECTED LIFE TIME

CHAPTER 6
TROUBLESHOOTING

6.1 INTRODUCTION

6.1.1 General

This chapter provides the procedures to be followed in order to locate the faulty component when a trouble arises in the SRT S-Band Up Mast.

6.1.2 Organization

The troubleshooting procedures are described by means of flow charts. When the faulty component is located, refer to Table 6.2.4 -
List Of Main Possible Failures for its replacement.

6.1.3 Personnel

The personnel involved in the troubleshooting procedures must be skilled technicians only who has a good knowledge of the equipment.

6.1.4 Tools and instruments

For the execution of the troubleshooting procedures, besides usual tools (screwdrivers, pliers, etc.), the following instruments are required:

Table 6.1.1 List of Recommended Tools and Instruments

DESCRIPTION	TYPE	NOTE
Set of screwdrivers	USAG	Insulated handle
Set of open wrenches	USAG	
Set of socket wrenches	USAG	
Set of torx wrenches	USAG	
Set of socket hexagonal	USAG	
Soldering tool	SILVERSTAT	
Vacuum cleaner		
Digital multimeter	CHAUVIN ARNOUX CPA 9651 (3:5)	(or equivalent)
Oscilloscope	Tektronix	

6.2 TROUBLESHHOTING PROCEDURES

6.2.1 Safety precautions

WARNING

SET THE SAFETY SWITCH TO OFF AND HANG UP A PLACARD READING “WORK IN PROGRESS DO NOT SWITCH ON.

WARNING

OPERATE WITH CARE ON THE TXRX UNIT BECAUSE OF HIGH VOLTAGE AND HIGH POWER.

6.2.2 Troubleshooting operation

Table 6.2.4 - List Of Main Possible Failures describes the failures that can be experienced during operation of the equipment. If the failure occurred is not listed, contact the Manufacturer’s Service department.

Table 6.2.1 List Of Main Possible Failures when TXRX does not transmit

PROBLEM	STEP	CHECK	YES	NO	SOLUTION
TXRX No Data	1	Presence of 50 V on SRT SPINT		•	External problem or connection
	2	Presence of 50 V on SRT SPINT	•		Check the voltage (50 V) on SRT POWER
		Led D1 SRT_PWR lighted		•	
	2.1	Presence of 50 V on SRT SPINT	•		Problem of interconnection
		Led D1 SRT_PWR lighted		•	
		Check the voltage (50 V) on SRT POWER		•	
	2.2	Presence of 50 V on SRT SPINT	•		Replace the SRT POWER
		Led D1 SRT_PWR lighted		•	
		Check the voltage (50 V) on SRT POWER	•		
	3	Presence of 50 V on SRT SPINT	•		Replace the SRT POWER (After that, repeat step three and continue)
		Led D1 SRT_PWR lighted	•		
		Led D2 SRT_PWR lighted		•	
	4	Presence of 50 V on SRT SPINT	•		Check if the condition of the SRT CONTROL's Leds in paragraph 3.2 are met.
		Led D1 SRT_PWR lighted	•		
		Led D2 SRT_PWR lighted	•		
	5	The condition at paragraph 3.2 are met	•		Contact manufacturer's service department
		The condition at paragraph 3.2 are met		•	Replace the SRT CONTROL

** Follow the order of steps for proper control of the system.*
*** Refer to Fig.1.1.9 – Par.4.4*

Table 6.2.2 List Of Main Possible Failures when Antenna data is Missing

PROBLEM	STEP	CHECK	YES	NO	SOLUTION
Antenna data is missing	1	Check HL_IN and AZ_IN signal on SRT CONTROL		•	Replace Encoder or Bearing Reader
	2	Check HL_IN and AZ_IN signals on SRT CONTROL	•		Replace SRT CONTROL
		Check HL_OUT and AZ_OUT signals on SRT CONTROL		•	
	2.1	Check HL_IN and AZ_IN signals on SRT CONTROL	•		Problem external of TXRX or problem of interconnection
		Check HL_OUT and AZ_OUT signals on SRT CONTROL	•		

** Follow the order of steps for proper control of the system.*
*** Refer to Fig.1.1.9 – Par.4.4*

Table 6.2.3 List Of Main Possible Failures of Communication

PROBLEM	STEP	CHECK	YES	NO	SOLUTION
The antenna does not rotate	1	Check that the Brushless Controller is on.	•		Check that the Fail LED is on.
				•	Check that voltage (50V) arrives at the Brushless Controller.
	1.1	Check that the Brushless Controller is on.		•	Check that voltage (50V) arrives at the TB6 connector (SRT SPINT).
		Check that voltage (50V) arrives at the Brushless Controller.		•	
	1.1.1	Check that the Brushless Controller is on.		•	External problem outside the SRT S-Band Up Mast.
		Check that voltage (50V) arrives at the Brushless Controller.		•	
		Check that voltage (50V) arrives at the TB6 connector (SRT SPINT).		•	
	1.1.2	Check that the Brushless Controller is on.		•	Substitute the power cable of the Brushless Controller.
		Check that voltage (50V) arrives at the Brushless Controller.		•	
		Check that voltage (50V) arrives at the TB6 connector (SRT SPINT).	•		
	1.2	Check that the Brushless Controller is on.	•		Follow the instructions reported in paragraph 4.3.5.1.
		Check that the Fail LED is on.	•		
	1.3	Check that the Brushless Controller is on.	•		Check that voltage (15V) arrives at the TB2 connector (SRT CONTROL).
		Check that the Fail LED is on.		•	
	1.3.1	Check that the Brushless Controller is on.	•		Substitute the connection cable of the SRT CONTROL Brushless Controller
		Check that the Fail LED is on.		•	
		Check that voltage (15V) arrives at the TB2 connector (SRT CONTROL).	•		
	1.3.2	Check that the Brushless Controller is on.	•		Check that voltage (50V) arrives at the TB1 connector (SRT SPINT).
		Check that the Fail LED is on.		•	
		Check that voltage (15V) arrives at the TB2 connector (SRT CONTROL).		•	
	1.3.2.1	Check that the Brushless Controller is on.	•		External problem outside the SRT S-Band Up Mast.
		Check that the Fail LED is on.		•	
		Check that voltage (15V) arrives at the TB2 connector (SRT CONTROL).		•	
		Check that voltage (50V) arrives at the TB1 connector (SRT SPINT).		•	
	1.3.2.2	Check that the Brushless Controller is on.	•		Substitute the connection cable between the SRT CONTROL and the SRT SPINT.
		Check that the Fail LED is on.		•	
		Check that voltage (15V) arrives at the TB2 connector (SRT CONTROL).		•	
		Check that voltage (50V) arrives at the TB1 connector (SRT SPINT).	•		

** Follow the order of steps for proper control of the system.*
*** Refer to Fig.1.1.9 – Par.4.4*

Table 6.2.4 List Of Main Possible Failures

TXRX DOES NOT TURN ON	TRANSMITTER CAN'T BE CONTROLLED	TRANSMITTER PERFORMANCE IS LOW	TRANSMITTER DOES NOT GENERATE RF	POTENTIAL CAUSE	CHECK	REMEDY
X				Power Supply damaged.	Check 50 V on Tb2 on SRT_PWR_DC, if missing check line (220 V)	If is 220V replace Power supply following par wer , else connect line voltage
			X	SRT_POWER_DC is damaged	Check the 700 V on TB3 and the 15V on TB1	If a voltage is missing replace SRT_PWR_DC following par.7.5.4
X				Video signal interrupt	Check video signal quality	Repair video cable damaged
		X		Magnetron is in End Of Life	Check Fail and the Magnetron works time	Replace Magnetron following par.7.5.2
			X	SRT_MOS is damaged	Check TR_Pull and TR_Push on SRT_Control	If the two signals are presents replace SRT_MOS board following par.7.5.4
			X	SRT_Control damaged	Check on SRT_Control TR_Push,TR_Pull,	If the two signal are missing replace SRT_Control following par.7.5.4
X	X	X	X	Call Assistance	Contact manufacturer's service department	

Table 6.2.5 List Of Main Possible Failures

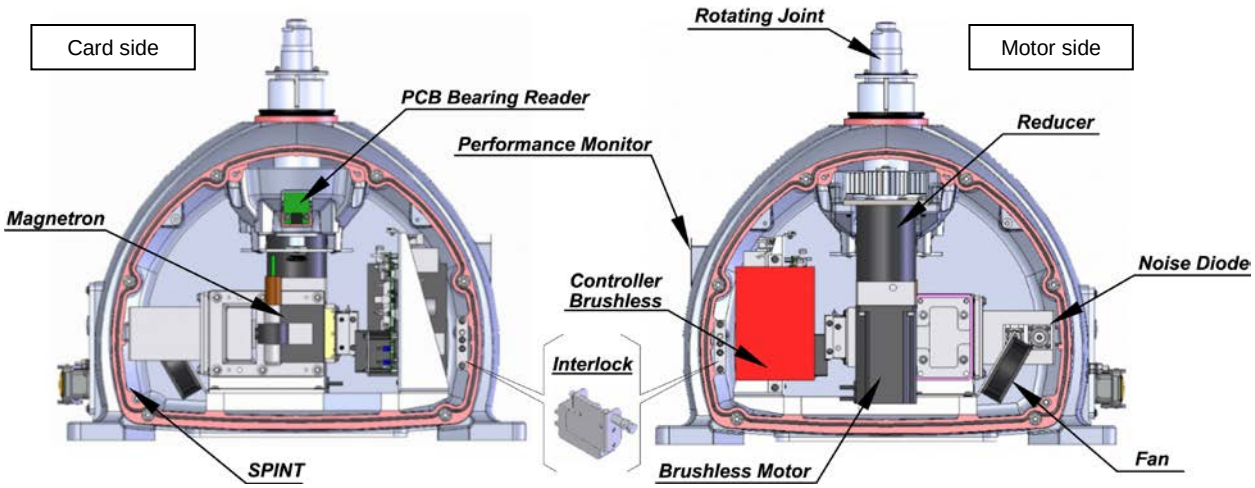
FAILURE MESSAGE	REMEDY	OTHERS
MAGN HEAT FAIL	Replace the SRT MOS Board	If the problem still exists, replace the SRT PWR-DC board
24 VCO FAIL	Replace the SRT PWR-DC board	
+15 FAIL	Replace the SRT PWR-DC board	
RX FAIL	Replace the SRT CONTROL board	
CRC FAIL	Replace the SRT CONTROL board	
INTERLOCK OPEN	Check if the door is correctly closed if yes replace the internal safety switch	
SAFETY SWITCH OPEN	Close the safety switch	
+48 FAIL	Replace the Power supply	
FRONT END FAIL	Replace the RF DETECTOR LNFE ASSY	
MAGNETRON EOL	Replace the MAGNETRON	
MODULATION FAIL AND LOW PWR LEVEL	Replace the MAGNETRON	If the problem still exists, replace the SRT MOS board
POOR PICTURE ON THE SCREEN (PERFORMANCE IS DEGRADED)	Proceed to the automatic tuning, if tuning bar is too low replace the RF DETECTOR LNFE ASSY	If the poor picture is still on the screen replace the S-BAND TR LIMITER
BIG BALL ON THE CENTER OF THE SCREEN AND WEAK SIGNAL FROM FAR RANGERS ECHOES	Wave guide damaged, proceed to a full inspection of wave guide. Dry it if it is necessary and if it seems corroded then replace the duplexer and/or the S-BAND TR LIMITER and/or the MAGNETRON and/or the RF DETECTOR LNFE ASSY	
LOW PWR LEVEL	Replace the DIODE assembly	
NO RING ON THE SCREEN WHEN USING PERFORMANCE MONITOR TEST	Replace the DIODE assembly	
TX/RX OVERHEATING	Check the enviroment of the TX/RX room	
NO COMMUNICATION	List Of Main Possible Failures of Communication	

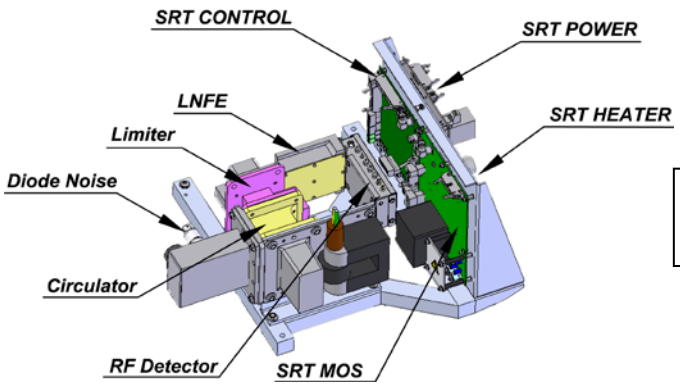
CHAPTER 7
CORRECTIVE MAINTENANCE

7.1 INTRODUCTION

This chapter provides the procedure, which must be followed in order to replace a faulty component of the SRT S-Band Up Mast according to the troubleshooting procedures of Par. 6.2 - Troubleshhoting procedures.

Obviously, the substitution operation will only be described for the parts that can be supplied as spare parts (refer to paragraph 8.2). To facilitate this, refer to the figure below where these components and their positions are indicated.





7.2 SAFETY PRECAUTIONS

Unless otherwise specified in the procedures for the corrective maintenance operations, the following safety rules must be observed:

- each maintenance operation must be carried out only after the equipment is switched off
- before removing any component, be sure the spare part is available
- verify the integrity of the spare part and, if possible, perform a functional test.

7.3 PERSONNEL

The replacement operation must be carried out exclusively by skilled personnel with a good knowledge of the equipment.

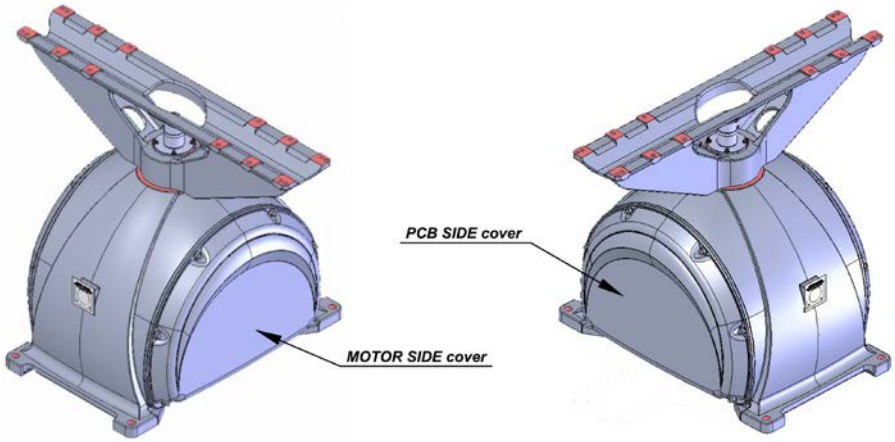
7.4 REQUIRED TOOLS AND INSTRUMENTS

To carry out the replacement operations described in this chapter, only normal workshop tools (as screwdrivers, wrenches etc.) are required. Refer to the relative table for the instruments to be used: Table 6.1.1 - List of Recommended Tools and Instruments.

7.5 CORRECTIVE MAINTENANCE PROCEDURES

The SRT S-Band Up Mast internally contains all the instrumentation necessary to manage the transmission, receiving and codification of the radar impulses, as well as the instrumentation for the movement of the antenna. To permit the operator to carry out any maintenance or repair of these elements, two removable side inspection covers. The two covers are identified as follows:

- MOTOR SIDE cover : refer to Fig. 1.1.26 – Identification of the inspection covers
- BOARD SIDE cover : refer to Fig. 1.1.26 – Identification of the inspection covers



1.1.25 *Identification of the inspection covers*

The following table (Table 7.5.1 – List of components and relative intervention zone

(x) indicates each component on which it is possible to intervene and the inspection cover (recommended) to remove.

Table 7.5.1 List of components and relative intervention zone

COMPONENT	MOTOR SIDE COVER	BOARD SIDE COVER	NONE
RF CABLE		X	
HEATER KIT		X	
SPINT		X	
ROTATING JOINT		X	
BOARD BEARING READER		X	
MAGNETRON		X	
INTERLOCK BOARD SIDE		X	
INTERLOCK MOTOR SIDE	X		
BRUSHLESS CONTROLLER	X		
FAN (ONLY HSC SYSTEM)	X		
BRUSHLESS MOTOR	X		
NOISE DIODE	X		
REDUCER	X		
CIRCULATOR	X	X	
LIMITER	X	X	
SRT CONTROL	X	X	
SRT MOS	X	X	
SRT PWR-DC	X	X	
RF DETECTOR & LNFE	X	X	
PERFORMANCE MONITOR			X

WARNING

REMEMBER THAT AT EVERY INTERVENTION TO SUBSTITUTE A PART, DISCONNECT THE MAIN ELECTRICITY SUPPLY OF THE UNIT SO THAT THERE IS NO LIVE INSTRUMENT WITH VOLTAGE. DISCONNECT THE ELECTRICAL FEED USING THE SWITCH LOCATED EXTERNALLY OF THE SRT S-BAND UP MAST.

7.5.1 Disassemble the inspection covers of the SRT S-Band Up Mast

NOTE
The following procedure is valid either for the disassembly of the MOTOR SIDE cover or the PCB SIDE cover .

a) Required Tools

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

Silicone grease compound 340

b) Opening

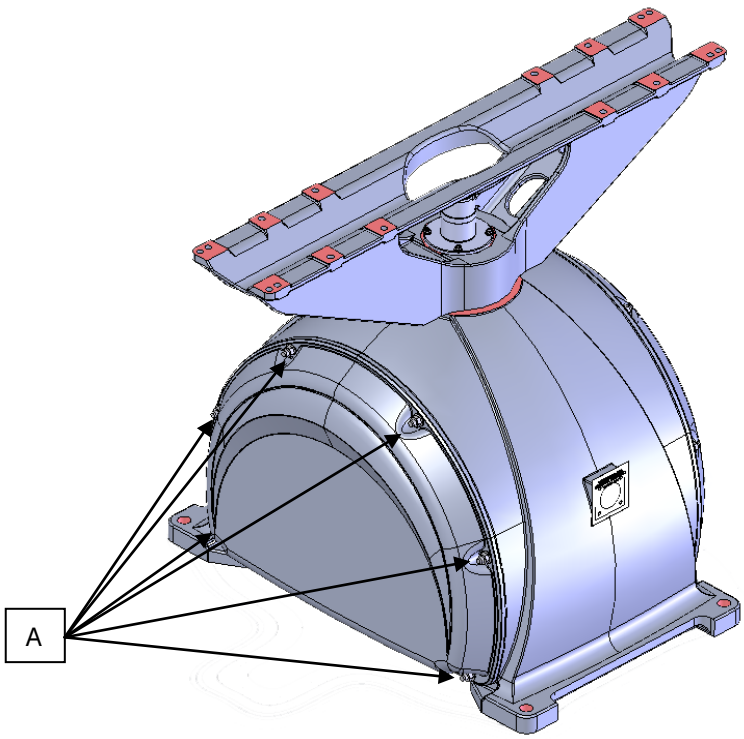
1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. Unscrew the 6 M8 bolts (Fig.1 – Pos. A) utilising the appropriate spanner.

3. Move the panel towards the outside.
ATTENTION: when the panel is free ensure that the safety chain is properly anchored both to the cover and the structure of the SRT S-Band Up Mast.

4. Accompany the panel in such a way that the chain eventually supports it.

5. Control that the gasket remains in its seat.



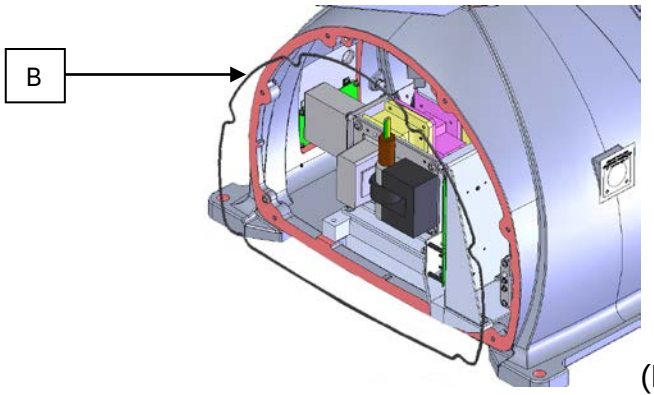
(Fig. 1)

c) Closing

1. IMPORTANT: Grease the gasket (Fig. 2 – Pos. B) with a silicone grease spray before assembling the inspection cover.

2. For the installation, perform the removal operations in reverse order.

3. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

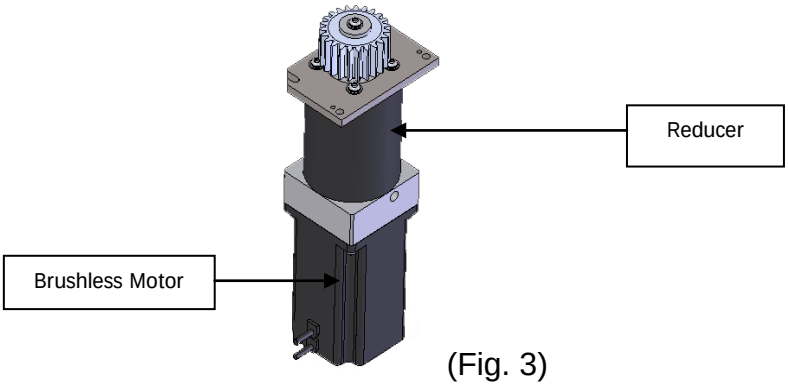


(Fig. 2)

7.5.2 **Disassemble the motor unit**

To make the substitution or repair of the elements that compose the motor unit (Fig. 3) simpler, remove the motor unit completely and intervene on each single element once it has been extracted from the SRT S-Band Up Mast structure. This unit is composed of:

- The motor
- The reducer



(Fig. 3)

a) Required Tools

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

Silicone grease compound 340

b) Remove the motor assembly

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN

PROGRESS - DO NOT SWITCH ON".

2. Carry out the disassembly procedure of the MOTOR SIDE cover.

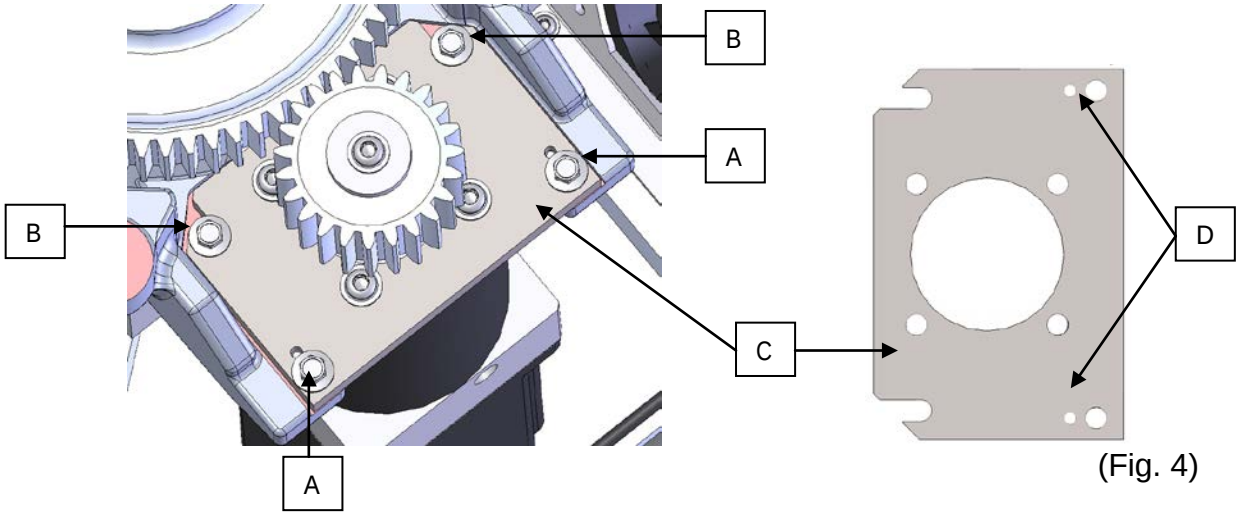
3. Remove the connector on the side of the Brushless Motor.

4. Completely remove the two HEX M5 screws (Fig. 4 – Position A).

5. Partially unscrew the two HEX M5 screws (Fig. 4 – Position B) so that the plate that supports the motor can be extracted (Fig. 4 – Position C).

ATTENTION: Figure 4 – Pos. C shows the geometry of the motor support plate. It is on the left with eye bolts that permit the plate to slide without having to extract the two M5 screws (Fig. 4 – Pos. B). Anyway, on the right are two small holes (Fig. 4 – Pos. D). They are prearranged to house the reference pins so that the plate can be centred correctly. Lift the plate by a few millimetres and the motor unit is freed from the plate pins.

6. Extract the motor unit towards the outside.



(Fig. 4)

c) Installation

1. For the installation, perform the removal operations in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.3 **Substitution of the brushless motor**

a) Required Tools

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

b) Remove

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang to it a placard reading "WORK IN

PROGRESS - DO NOT SWITCH ON".

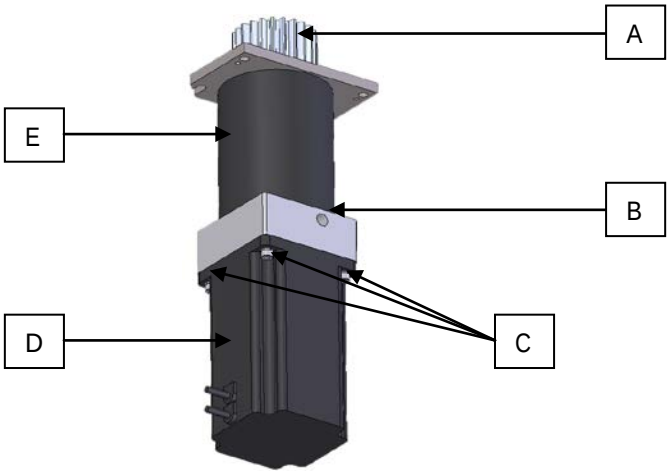
2. By following the procedures of paragraph 7.5.1, remove the MOTOR SIDE cover.

3. By following the procedures of paragraph 7.5.2, remove the Motor Unit.

4. Once the unit has been removed manually rotate the toothed wheel (Fig. 5 – Pos. A) until the head of the TCEI M6 screw does not appear anymore in the hole (Fig. 5 – Pos. B) on the reducer and slacken (without removing) the screw.

5. Unscrew the four TCEI M5 screws using the appropriate spanner (Fig. 5 – Pos. C).

6. Remove the motor (fig. 5 – Pos. D).



(Fig. 5)

c) Installation

1. For the installation, perform the removal operations in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.4 **Substitution of the reducer**

a) Required Tools

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

Set of torx wrenches

b) Remove

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.1, remove the MOTOR

SIDE cover.

3. By following the procedures of paragraph 7.5.2, remove the Motor unit.

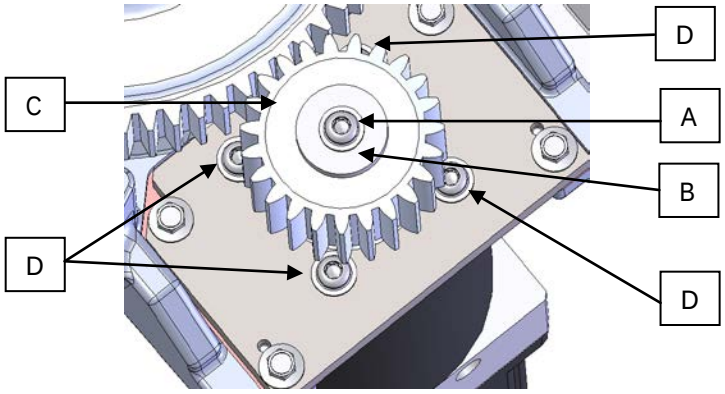
4. By following the procedures of paragraph 7.5.3, remove the Brushless Motor.

5. Unscrew the T30 Torx screw using the appropriate spanner (Fig. 6 – Pos. A) positioned above the toothed wheel.

6. In this order, remove the washer (Fig. 6 – Pos. B) and successively the toothed wheel (Fig. 6 – Pos. C).

7. Utilising the appropriate spanner, unscrew the four Torx T30 screws that fix the reducer to the bracket (Fig. 6 – Pos. B).

8. Remove the reducer (Fig. 5 – Pos. E).



(Fig. 6)

c) Installation

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.5 **Substitution of the fan (only for HSC system)**

a) Required Tools:

Set of screwdrivers

Set of open wrenches

Set of torx wrenches

b) Remove

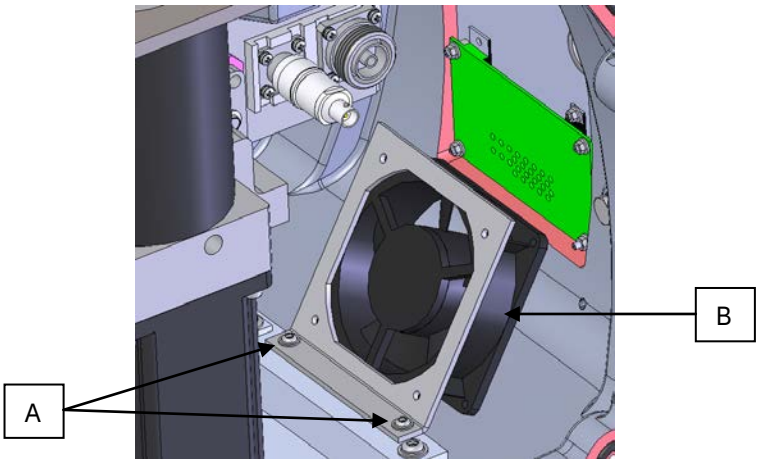
1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.1, remove the MOTOR SIDE cover.

3. Disconnect the connectors coming from the SRT CONTROL, bearing in mind their positions.

4. Utilising the appropriate spanner, remove the two T20 Torx screws (Fig. 7 – Pos. A).

5. Remove the fan (Fig. 7 – Pos. B).



(Fig. 7)

c) Installation

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.6 **Substitution of the SPINT BOARD**

a) Required Tools:

Set of screwdrivers

Set of torx wrenches

b) Remove

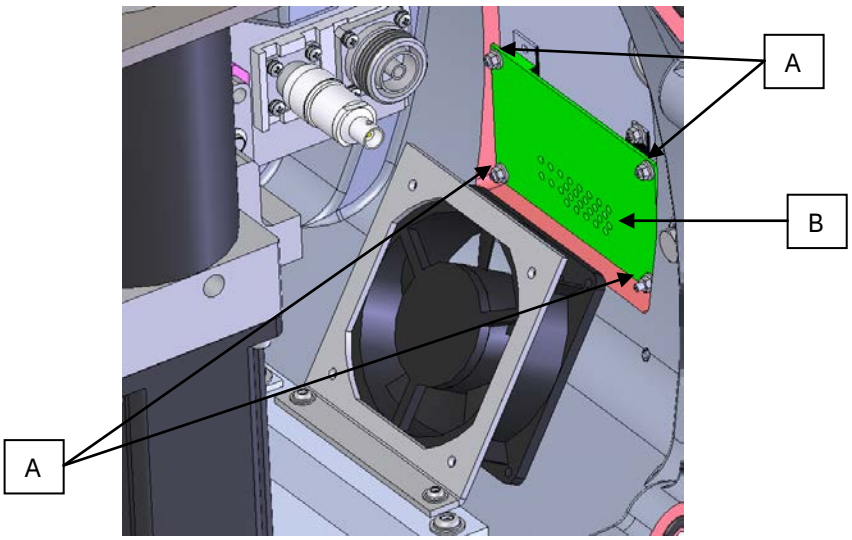
1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.1, remove the MOTOR SIDE cover.

3. Disconnect the connectors from the SPINT board, bearing in mind their positions.

4. Utilising the appropriate spanner, remove the four M3 nuts (Fig. 8 - Pos. A).

5. Remove the SPINT board (Fig. 8 – Pos. B).



(Fig. 8)

c) Installation

1. For the installation, perform the removal operation in reverse order.

Table 7.5.2 Table of PIN connector Harting

PIN	CONNECTIONS	DESCRIPTION
1	SFR	Safety switch contact return
2	SF	Safety switch contact. No connection between SF and SFR to stop antenna turning and TX RX transmission
3	GND	GROUND reference
4	GND	GROUND electronics
5	V50E	+50 VDC electronics supply
6	GND	GROUND reference
7	VDOUT	Combined video output
8	GND	GROUND reference (YELLOW-GREEN)
9	GND	GROUND motor
10	V50M	+50 VDC motor supply

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.7 **Replace the Noise diode**

a) Required Tools:

Set of screwdrivers

b) Remove

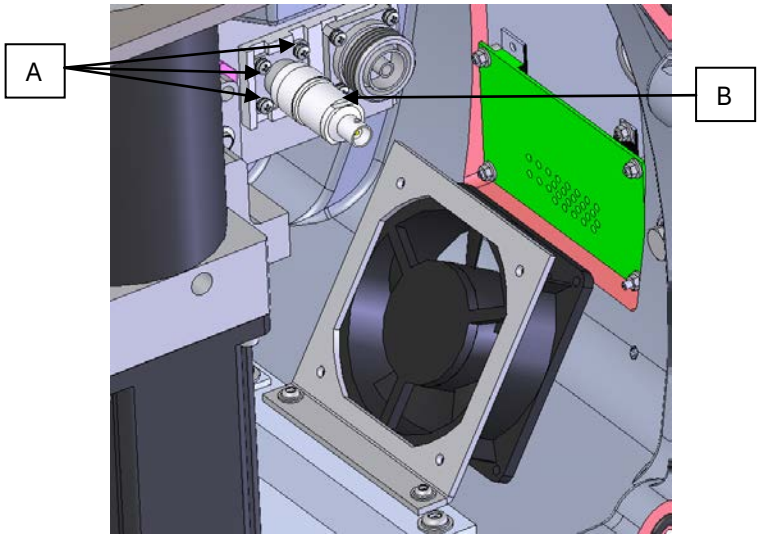
1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.1, remove the MOTOR SIDE cover.

3. Disconnect the connector from the Noise diode, bearing in mind its position.

4. Utilising the appropriate spanner, remove the four M3 screws (Fig. 9 - Pos. A).

5. Remove the Noise diode (Fig. 9 – Pos. B).



(Fig. 9)

c) Installation

1. In order to install the new Noise Diode, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.8 **Substitution of the Brushless controller**

a) Required Tools:

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

b) Remove

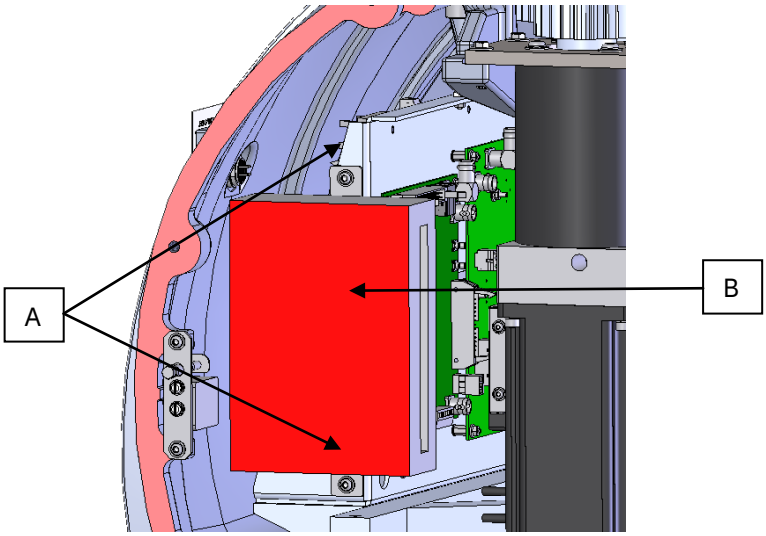
1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang upt a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.1, remove the MOTOR SIDE cover.

3. Disconnect the connectors that are attached to the Brushless Controller, bearing in mind their positions.

4. Utilising the appropriate spanner, remove the two T20 Torx screws (Fig. 10 – Pos. A).

5. Remove the brushless controller (Fig. 10 – Pos. B).



(Fig. 10)

c) Installation

1. In order to install the new Noise Diode, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.9 **Replace the Interlock**

NOTE
This procedure is valid for both the motor side interlock and the board side interlock.

a) Required Tools:

Set of screwdrivers

b) Remove

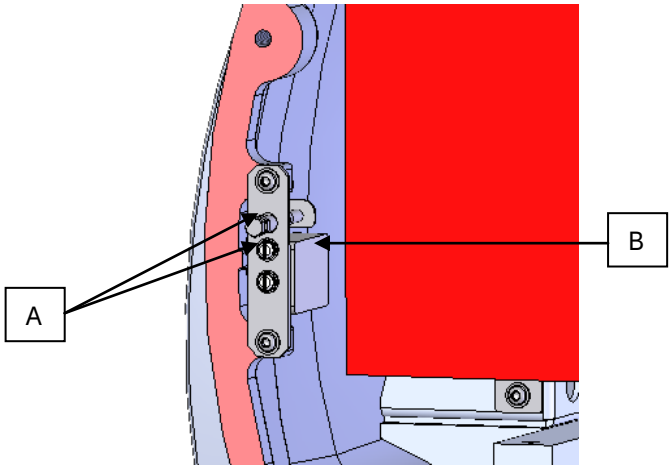
1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.1, remove the MOTOR SIDE cover.

3. Disconnect the connectors that are connected to the Interlock, bearing in mind their positions.

4. Utilising the appropriate spanner remove the two M3 screws (Fig. 11 – Pos. A).

5. Remove the Interlock (Fig. 11 – Pos. B).



(Fig. 11)

c) Installation

1. In order to install the new Noise Diode, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.10 **Substitution of the Bearing Reader Board**

a) Required Tools:

Set of screwdrivers

Set of torx wrenches

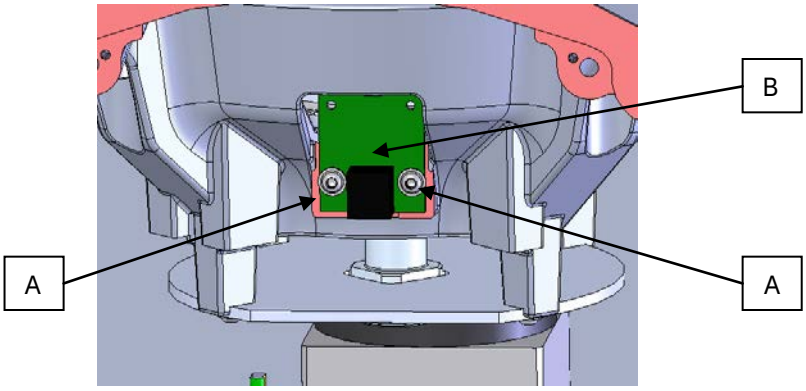
b) Remove

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.1, remove the BOARD SIDE cover.

3. Utilising the appropriate spanner, remove the two M3 screws (Fig. 12 – Pos. A).

4. Remove the BOARD Bearing Reader (Fig. 12 – Pos. B).



(Fig. 12)

c) Installation

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.11 **Substitution of the RF cable**

a) Required Tools:

(not applicable)

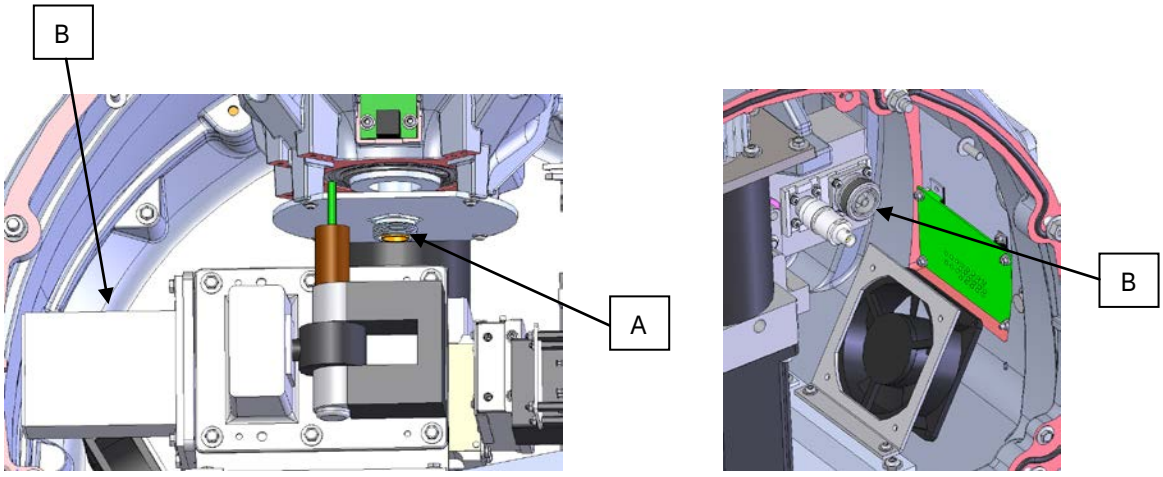
b) Remove

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.1, remove the BOARD SIDE cover.

3. In the internal part of the SRT S-Band Up Mast, manually unscrew and remove the high power radio frequency coaxial cable from the rotating joint (Fig. 13 – Pos. A) and from the RF HEAD (Fig. 13 – Pos. B).

4. Remove the RF cable.



(Fig. 13)

c) Installation

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.12 **Substitution of the Rotating Joint**

a) Required Tools:

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

Set of torx wrenches

b) Remove

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.1, remove the BOARD SIDE cover.

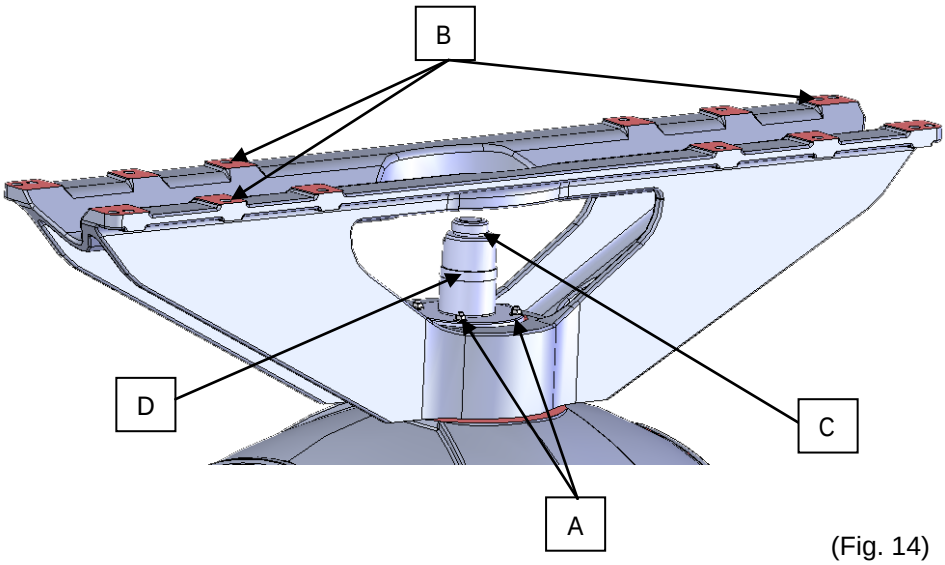
3. In the internal part of the SRT S-Band Up Mast manually unscrew and remove the high power radio frequency coaxial cable from the rotating joint (Fig. 13 – Pos. A; reference).

4. Outside the SRT S-Band Up Mast, unscrew and remove the cable that connects the antenna to the rotating joint by a 7/16 connector at 90° (Fig. 14 – Pos. A).

5. Utilising the appropriate spanner, remove the twelve M8 screws and remove the antenna (Fig. 14 – Pos. B).

6. Utilising the appropriate spanner, remove the four M3 nuts (Fig. 14 – Pos. A).

7. Remove the Rotating Joint (Fig. 14 – Pos. D).



(Fig. 14)

c) Installation

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.13 **Substitution of the Performance Monitor**

a) Required Tools:

Set of screwdrivers

Set of hexagonal wrenches

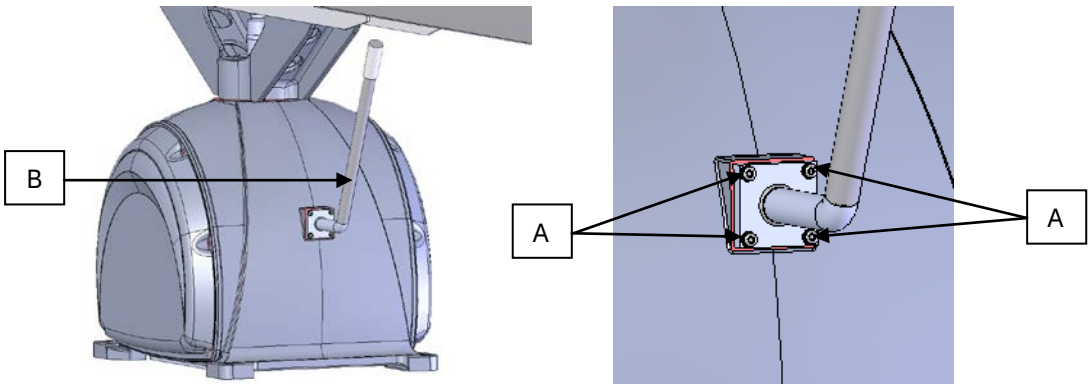
Set of torx wrenches

b) Remove

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. Utilising the appropriate spanner, remove the four T20 Torx screws (Fig. 15 – Pos. A).

3. Remove the Performance monitor (Fig. 15 – Pos. B).



(Fig. 15)

c) Installation

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.14 **Replace of the Magnetron**

a) Required Tools:

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

Silicone grease compound 340

b) Remove

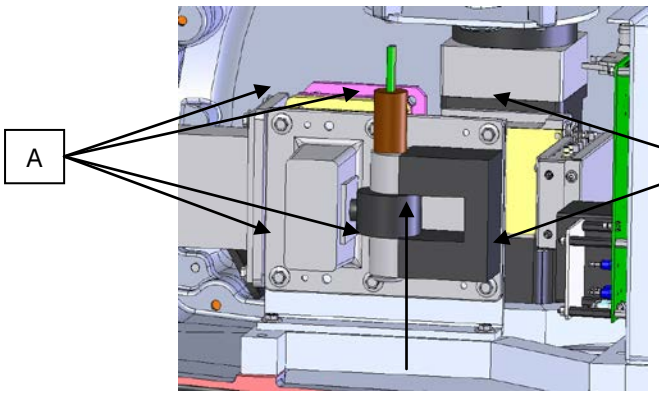
1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.1, remove the BOARD SIDE cover.

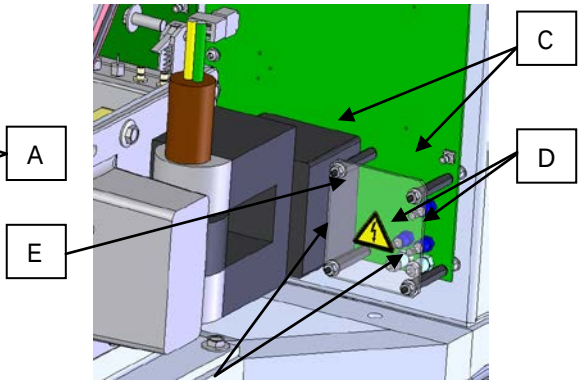
3. Disassemble the green and yellow cables from the cable tie (Fig. 16.1 – Pos. E), bearing in mind their positions and following the procedure as follows: unscrew the four M3 nuts (Fig. 16.1 – Pos. C) using the appropriate spanner. Remove the protection element. Unscrew the two M3 nuts (Fig. 16.1 – Pos. D). Disconnect the cables.

4. Utilising the appropriate spanner, remove the six M6 HEX screws (Fig. 16 – Pos. A).

5. Remove the Magnetron (Fig. 16 – Pos. B).



(Fig. 16)



(Fig. 16.1)

c) Installation

1. Before fastening the Magnetron to the proper seat, spread a layer of silicone grease on Magnetron surface which is in contact with the alloy in order to increase the Magnetron heating surface dissipation.

2. In order to install the new Magnetron, perform the removal operation in reverse order.

3. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

4. Position the Rotary Switch S1 (Par. 3.3 – Semi-operative controls) of SRT CONTROL Board on position 2.

5. On the SRT PWR-DC board, made a link P1 (Table 7.5.3 - Connectors of the SRT PWR-DC)

before switching on, wait for 30 minutes

6. By following the procedures of display manual, perform the VCO calibration.

7. Perform the following operation::

on the SRT PWR-DC remove the link P1

on SRT CONTROL Board, position S1 on 0 (zero)

8. Unlock and close the equipment cover by following the reverse procedure.

7.5.15 **Removal of the Board unit and the RF HEAD**

To substitute or repair the elements that compose the board unit and the RF HEAD (Paragraph 7.1 - Introduction), remove the bracket with the elements fixed to it and make it slide outside so that the single elements can be disassembled. This unit refers to the:

- Circulator
- Limiter
- LNFE & RF Detector
- SRT PWR-DC
- SRT MOS
- SRT CONTROL

Procedure for the removal of the Board unit and the RF HEAD

a) Required Tools:

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

Silicone grease compound 340

b) Removal of the Board unit and the RF HEAD

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. Carry out the disassembly procedure of the MOTOR SIDE cover and the BOARD SIDE cover (Paragraph 7.5.1 – Disassembly of the inspection covers of the SRT S-Band Up Mast).

3. Disconnect the connectors of the SPINT board, bearing in mind their positions.

3. Manually unscrew and remove the high-power radio frequency coaxial cable of the RF HEAD (Fig. 13 – Pos. A).

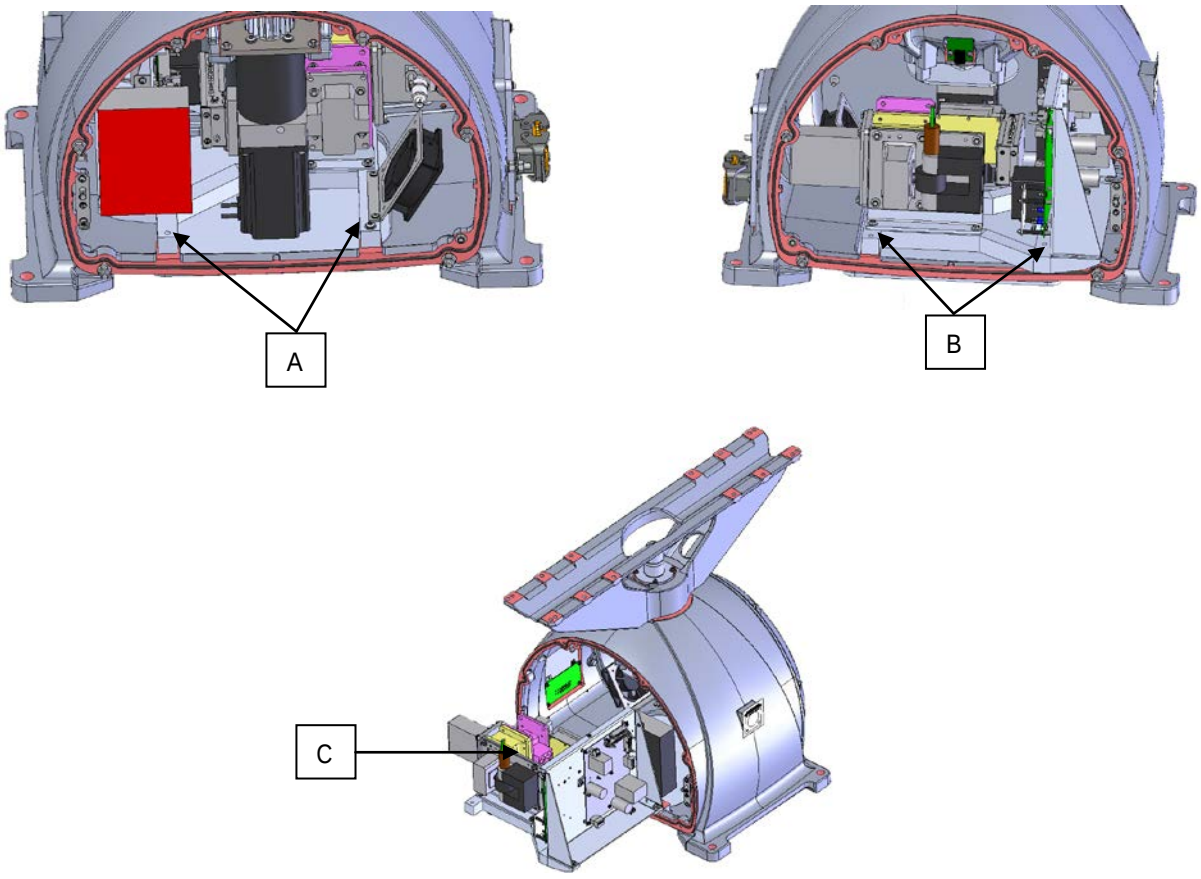
4. From the Motor side, completely unscrew the two socket HEX M6 screws (Fig. 17 – Position A).

5. From the Board side completely unscrew the two socket HEX M6 screws (Fig. 17 – Position B).

6. Remove towards the outside from the Board side the Board unit and the RF HEAD (Fig. 18).

7. Screw in the two socket HEX M6 screws (Fig. 17 – Position B) so

that the unit is supported as in Fig. 18.



(Fig. 17)

c) Installation

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.16 **Replace the LNFE & RF Detector**

a) Required Tools:

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

Silicone grease compound 340

b) Remove

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.15, remove the

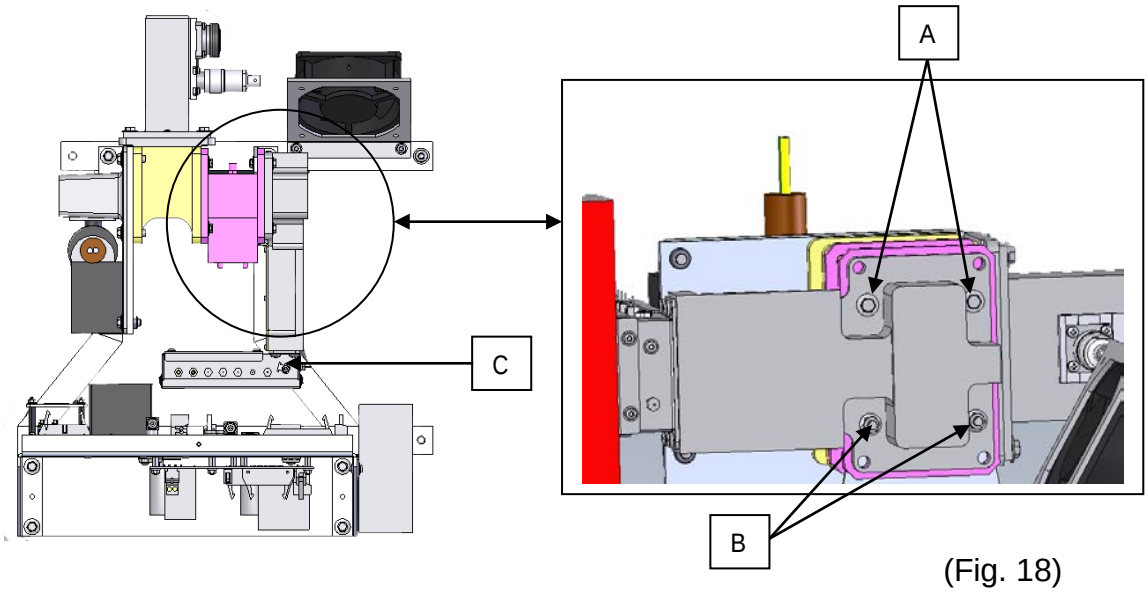
Board unit and the RF HEAD.

3. Disconnect the connectors that are connected to the LNFE and the RF Detector, bearing in mind their positions.

4. Utilising the appropriate spanner, remove the two HEX M5 screws (Fig. 18 – Pos. A).

5. Utilising the appropriate spanner, remove the two HEX M5 screws and the two M5 nuts (Fig. 18 – Pos. B).

6. Remove the LNFE and the RF Detector (Fig. 18 – Pos. C).



(Fig. 18)

c) Installation

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.17 **Replace the Limiter**

a) Required Tools:

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

Silicone grease compound 340

b) Remove

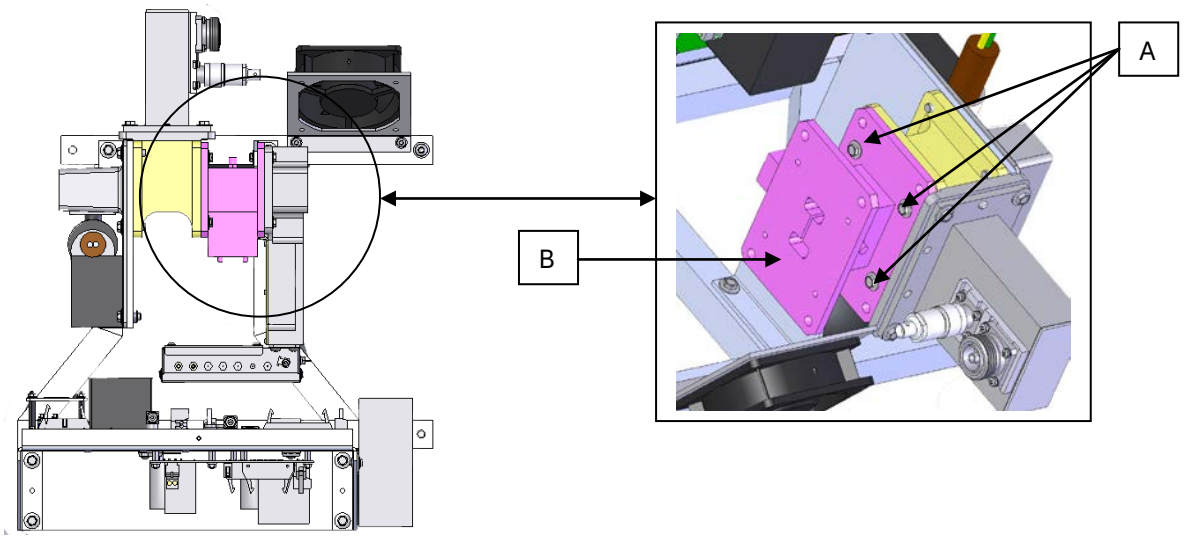
1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. By following the procedures of paragraph 7.5.15, remove the Board unit and the RF HEAD.

3. By following the procedures of paragraph 7.5.16, remove the LNFE and the RF Detector.

4. Utilising the appropriate spanner, remove the four HEX M5 screws (Fig. 19 – Pos. A).

5. Remove the Limiter (Fig. 19 – Pos. B).



(Fig. 19)

c) Installation

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.18 **Replace the Circulator**

a) Required Tools:

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

Silicone grease compound 340

b) Remove

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

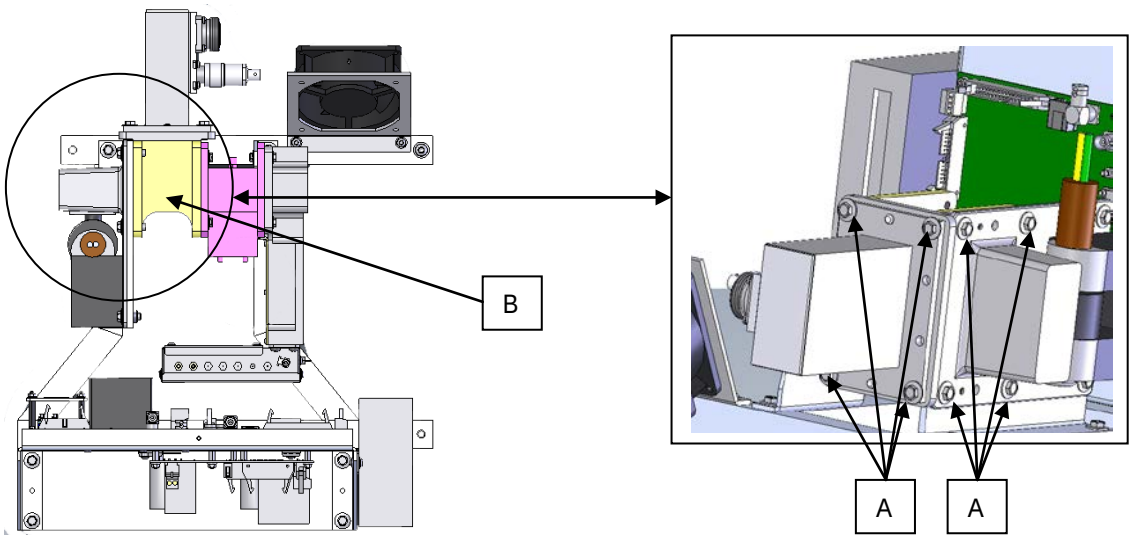
2. By following the procedures of paragraph 7.5.15, remove the Board unit and the RF HEAD.

3. By following the procedures of paragraph 7.5.16, remove the LNFE and the RF Detector.

4. By following the procedures of paragraph 7.5.17, remove the limiter.

4. Utilising the appropriate spanner, remove the eight HEX M5 screws (Fig. 20 – Pos. A).

5. Remove the Circulator (Fig. 20 – Pos. B).



(Fig. 20)

c) Installation

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

7.5.19 **Removal/Installation of the Electronics assy**

a) Required Tools:

Set of screwdrivers,

Set of open wrenches,

Set of hexagonal wrenches,

b) Removal

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON"

2. By following the procedures of paragraph 7.5.15, remove the Board unit and the RF HEAD.

For the SRT PWR-DC:

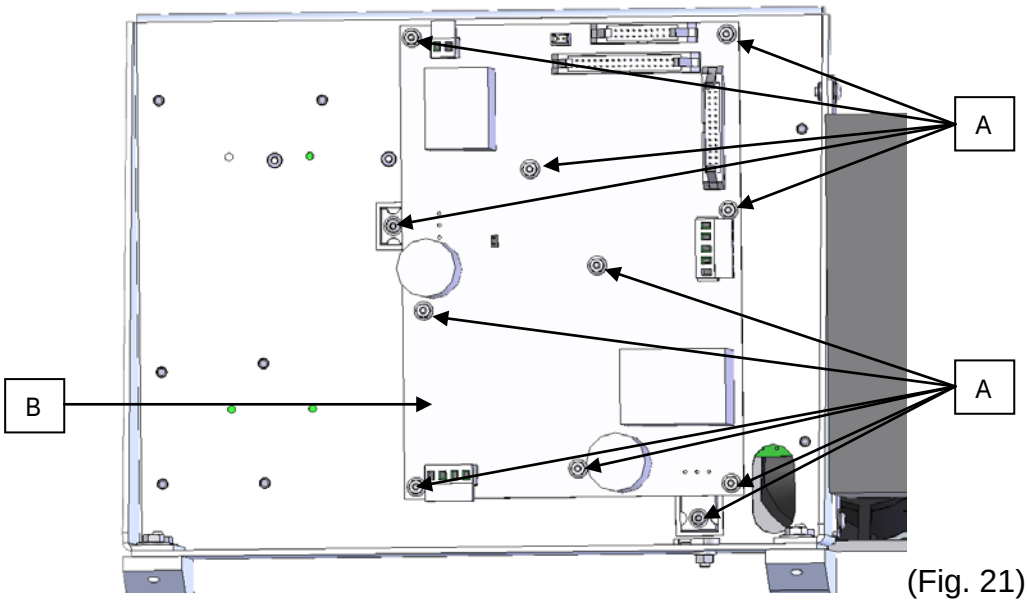
1. Remove the Electronics Rack cabling connectors, taking note of their position.

Table 7.5.3 Connectors of the SRT PWR-DC

BOARD	CONNECTOR	PURPOSE
SRT PWR-DC	TB2	Main Power input

2. By means of the proper screwdriver, unscrew the 11 nuts M3 (Fig. 21 – Position A) fixing the SRT PWR-DC to the Electronic Rack.

3. Remove the SRT PWR-DC (Fig.21 – Position B).



(Fig. 21)

For the SRT MOS:

1. Remove the Electronics Rack cabling connectors, taking note of their position.

Table 7.5.4 Connectors of the SRT MOS

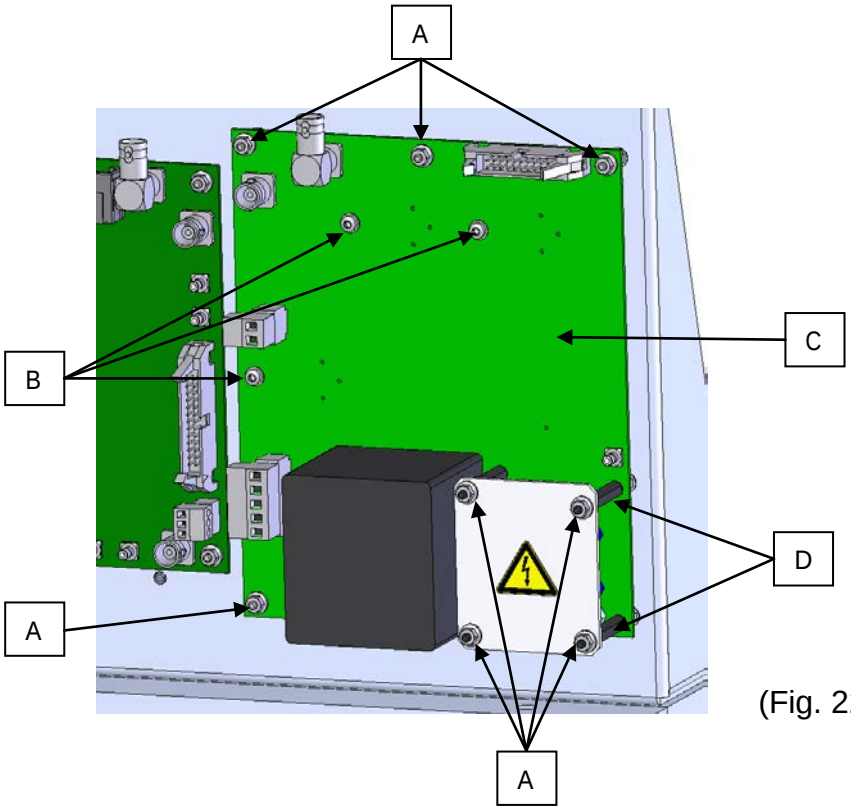
BOARD	CONNECTOR	PURPOSE
SRT MOS	A – K – Fil	Magnetron terminals

2. By means of the proper screwdriver, unscrew the 8 nuts M3 (Fig.22 – Position A) fixing the SRT MOS to the Electronic Rack.

3. By means of the proper screwdriver, unscrew the 3 M3 screws torx (Fig.22 – Position B) fixing the SRT MOS to the Electronic Rack.

4. Utilising the appropriate spanner, remove the four specer (Fig.22 – Position D)

5. Remove the SRT MOS (Fig.22 – Position C).



(Fig. 22)

For the SRT CONTROL:

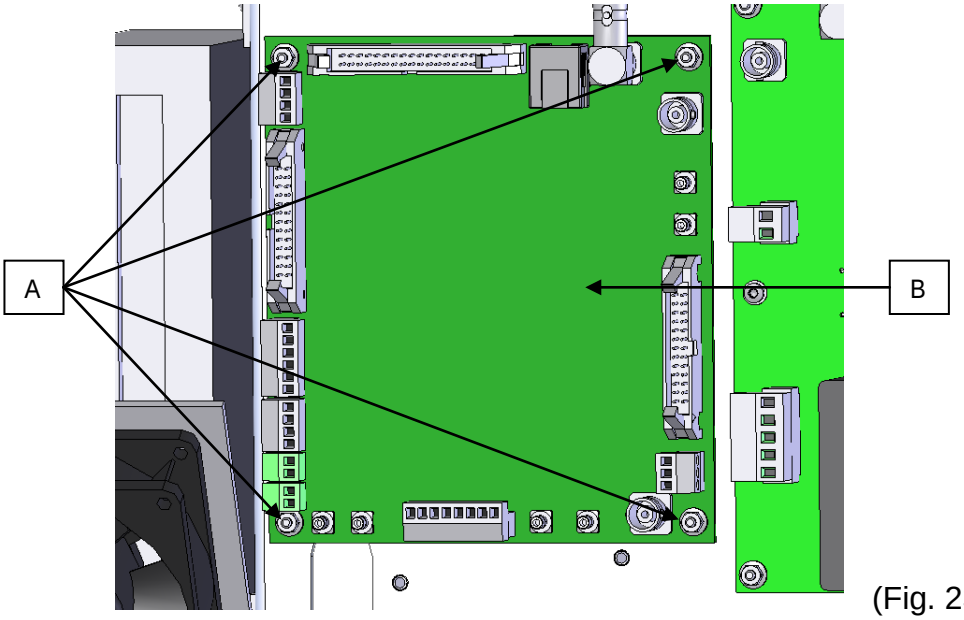
1. Remove the Electronics Rack cabling connectors, taking note of their position.

Table 7.5.5 Connectors of the SRT CONTROL

BOARD	CODE	CONNECTOR	PURPOSE
SRT CONTROL	973281A2	TB1	Interlock
		TB5	Performance monitor
		TB6	Cable for the optical read-out connection
		TB2	Motor signals
		P1	Controls to srt_pwr_dc
		TB7	Accelerometer data signal
		P2	Power from srt_pwr_dc
		J12	Lan connector
		J15	Trigger pull
		J18	Trigger push
		J17	Magnetron current
		P3	Signal to display
		TB8	Safety switch connector
		J19	Video out
		J14	Video in
		J11	Tuning input
		TB3	Signal from/to l.n.f.e.n.i.f.
		J5	Noise source
		J1	Noise detect

2. By means of the proper screwdriver, unscrew the 4 nuts M3 (Fig. 23 – Position A) fixing the SRT CONTROL Board to the Electronic Rack.

3. Remove the SRT CONTROL (Fig. 23 – Position B).



(Fig. 23)

c) Installation

1. Before installing the new electronics assy, remove the EEPROM U30 from the SRT CONTROL Board of the old Electronics Rack and replace it in the SRT CONTROL Board of the new one. If this operation is skipped, then the unit must be set up manually from blank to recover values and settings stored in the old board EEPROM.

2. In order to install the Electronics Rack, perform the Removal operations in reverse order.

WARNING

WHEN THE ELECTRONICS RACK IS INSERTED ON THE FIXING BOLTS PAY A LOT OF ATTENTION NOT TO DAMAGE THE WAVEGUIDE JOINT (Chapter 9).

7.6 **INSTALLATION THE HEATER KIT**

a) Required Tools:

Set of screwdrivers

Set of open wrenches

Set of hexagonal wrenches

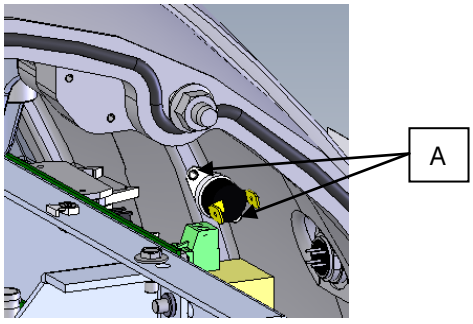
Silicone grease compound 340

b) Installation

1. On the electric switchboard, set the Main Line Breaker relevant to the unit to OFF and hang up a placard reading "WORK IN PROGRESS - DO NOT SWITCH ON".

2. Following the procedures of paragraph 7.5.15, remove the board unit and the RF Head.

3. From the board side and using the appropriate spanner, screw thermostat (A) to the SRT S-Band Up Mast structure using the two M3 screws (Fig. 24 – Pos. A).

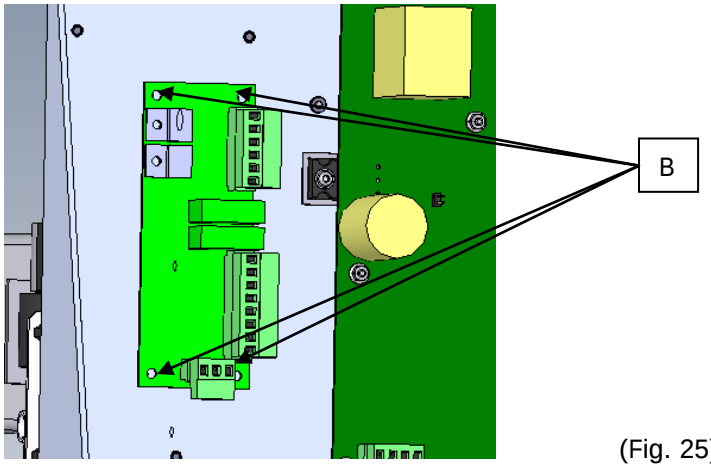


(Fig. 24)

4. Insert the SRT HEATER BOARD at the side of the SRT POWER unit and fix it with the four M3 screws (Fig. 25 – Pos. B).

5. Insert the two cartridge heaters in the foreseen housings (at the top on the left either from the board side or the motor side).

6. Connect the assembled kit to the electrical feed and the various components as described in the diagram at paragraph 9.2.4.



(Fig. 25)

c) Remove

1. For the installation, perform the removal operation in reverse order.

2. On the electric switchboard, set the Main Line Break relevant to the unit to ON and remove the warning placard.

CHAPTER 8
PARTS LIST

8.1 INTRODUCTION

This chapter provides the list of the SRT 30 Kw S-Band replaceable parts.

8.1.1 Parts list

The parts list is divided into major assemblies. All parts attached to the assemblies are listed in Parts List Tables. The Parts List Tables consist of eight columns as follows:

- **Column 1**: POS. (Position): The column shows where the reference figure can be found inside the manual.
- **Column 2**: FIGURE: The column supplies an image of the reference part.
- **Column 3**: DESCRIPTION: the column includes the descriptive identification data of the replaceable part.
- **Column 4**: PART NUMBER: the column reports the specification number or the type of the replaceable part assigned by the supplier.
- **Column 5**: REQUIRED QUANTITY (N): the column indicates, for each replaceable part, how many of them are assembled on the equipment.

8.1.2 Illustration of part location

Figures of Chapter 9 provide the location of the components. The position numbers of the items shown in the figure are referenced in the related Parts List Tables.

8.2 PARTS LIST TABLE

Table 8.2.1 Electronics Assy

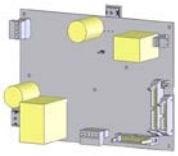
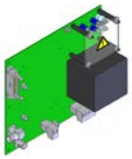
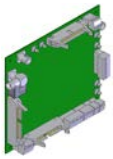
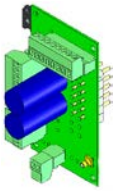
POS.	FIGURE	DESCRIPTION	PART NUMBER	REQUIRED QUANTITY(N)
Paragraph 4.3.1		SRT PWR-DC	**SP-973261A3-001**	1
Paragraph 4.3.2		SRT MOS	**SP-973271A3-001**	1
Paragraph 4.3.3		SRT CONTROL	**SP-973281A2-001**	1
Paragraph 4.3.4		SPINT	**SP-973531A2-001**	1
Paragraph 4.3.5		Brushless controller	**SP-47V201P001-001**	1

Table 8.2.2 RF Parts

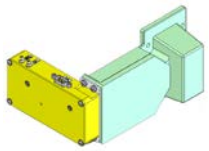
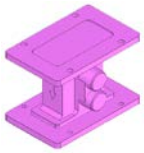
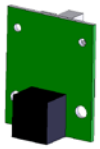
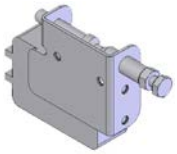
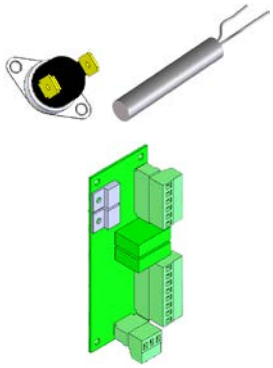
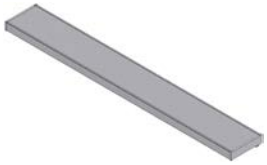
POSITION	FIGURE	DESCRIPTION	PART NUMBER	REQUIRED QUANTITY(N)
Paragraph 4.5.5		RF Detector & LNFE	**SP-304823A1-001**	1
Paragraph 4.5.3		Circulator	**SP-89A505P002-001**	1
Paragraph 4.5.4		Limiter	**SP-89A505P040-001**	1
Paragraph 4.5.2		Magnetron	**SP-89A505P020-001**	1
Paragraph 4.5.1		Noise Diode	**SP-302237A2-001**	1

Table 8.2.3 Motor Group

POSITION	FIGURE	DESCRIPTION	PART NUMBER	REQUIRED QUANTITY(N)
Paragraph 4.6.1		Brushless Motor	**SP-71M424P001-001**	1
Paragraph 4.6.2		Reducer	**SP-36G109P005-001**	1
Paragraph 4.8		Rotating joint	**SP-89A068P003-001**	1

Table 8.2.4 Various

POSITION	FIGURE	DESCRIPTION	PART NUMBER	REQUIRED QUANTITY(N)
Paragraph 4.7.1		Bearing Reader Board	**SP-973291A1-001**	1
Paragraph 4.7.2		Fan (only for HSC system)	**SP-71B301P001-001**	1
Paragraph 4.8		Performance Monitor	**SP-304958A1-001**	1
Paragraph 7.5.12		RF Cable	**SP-56C034P007-001**	1
Paragraph 7.5.9		Interlock	**SP-58M049P001-001**	2
Paragraph 4.7.3		HEATER Kit	**SP-304611A1-001**	1
Paragraph 2.6.2		Antenna	**ANT12SLP01**	1

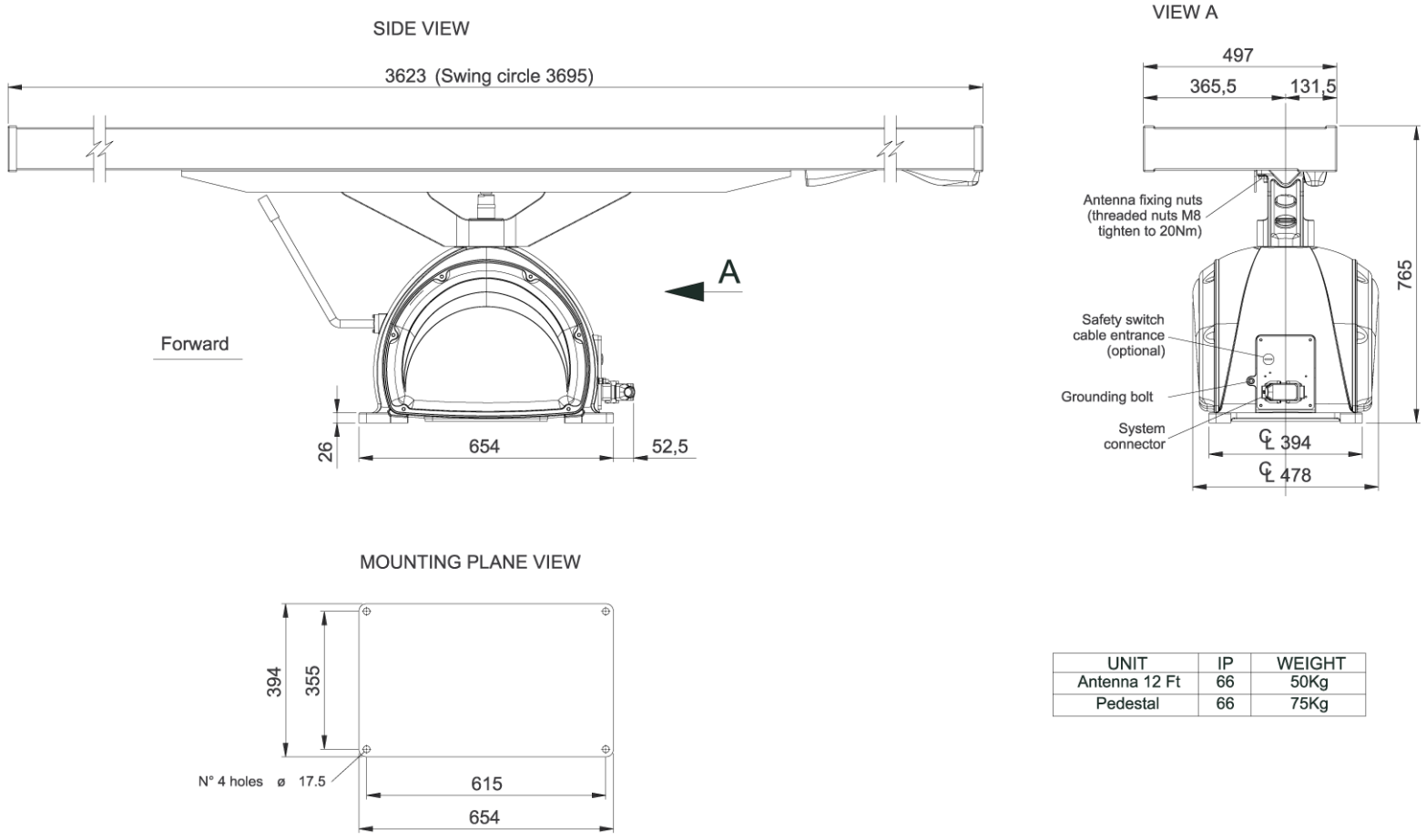
CHAPTER 9
INSTALLATION

9.1 INTRODUCTION

This chapter of the Technical manual can be used as a self-contained Installation Manual for the SRT S-Band Up Mast Radar System and 12 feet Antenna. It contains necessary information, pictures and drawings to handle, assemble and install this unit as a part of the complete Radar system. Actions how to prepare this unit for the Radar Setup Procedure are also described.

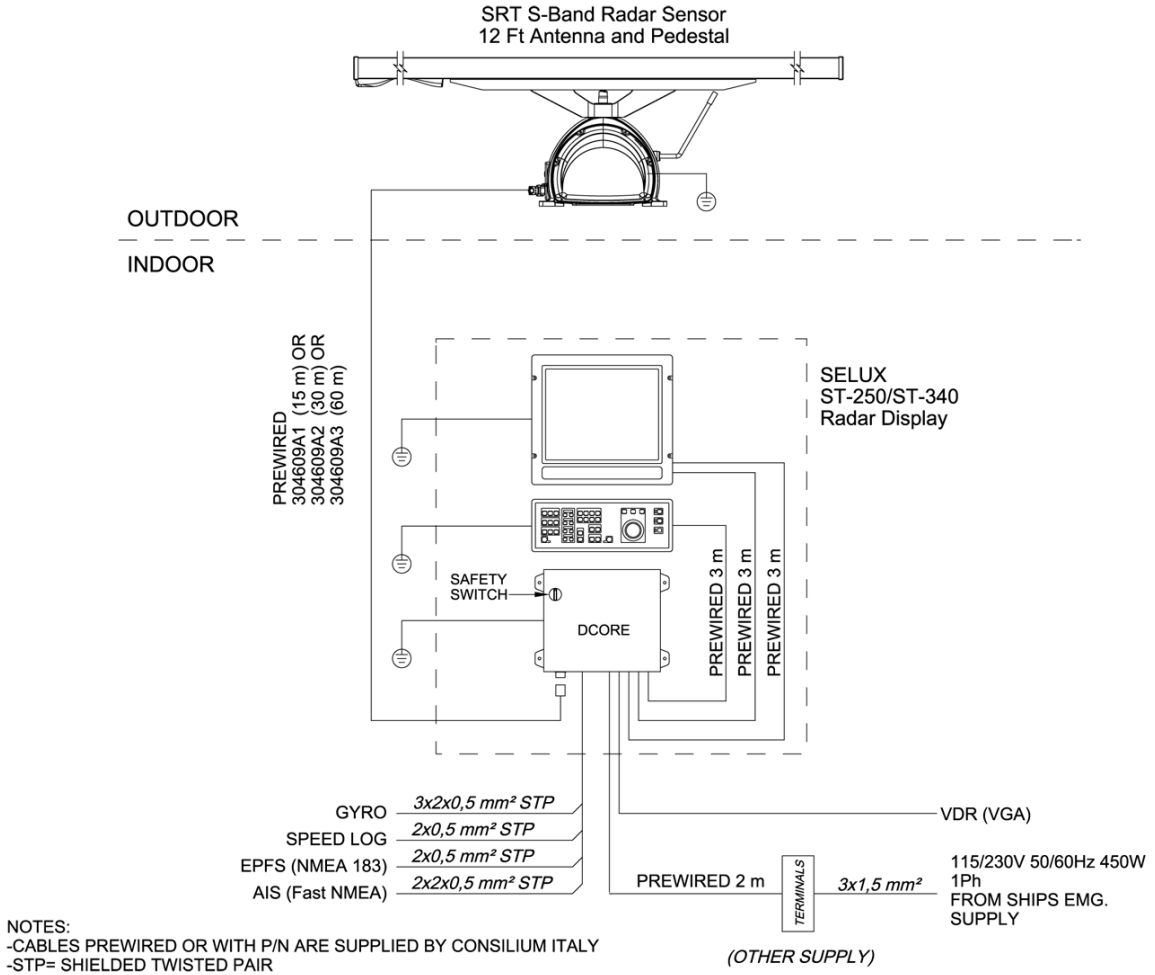
9.2 LAYOUT AND CONNECTION DIAGRAMS

9.2.1 **Layout SRT S-Band Up Mast**

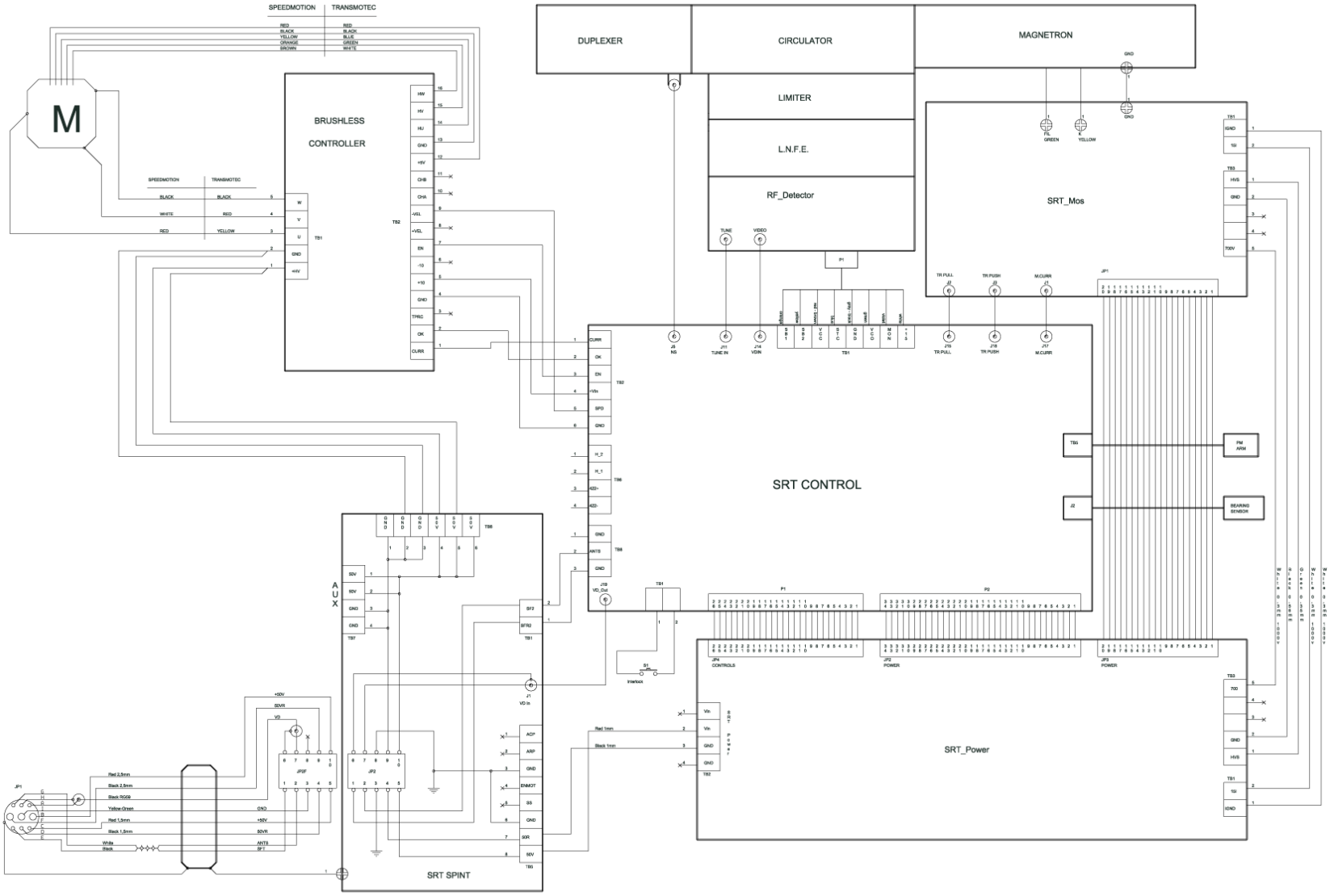


UNIT	IP	WEIGHT
Antenna 12 Ft	66	50Kg
Pedestal	66	75Kg

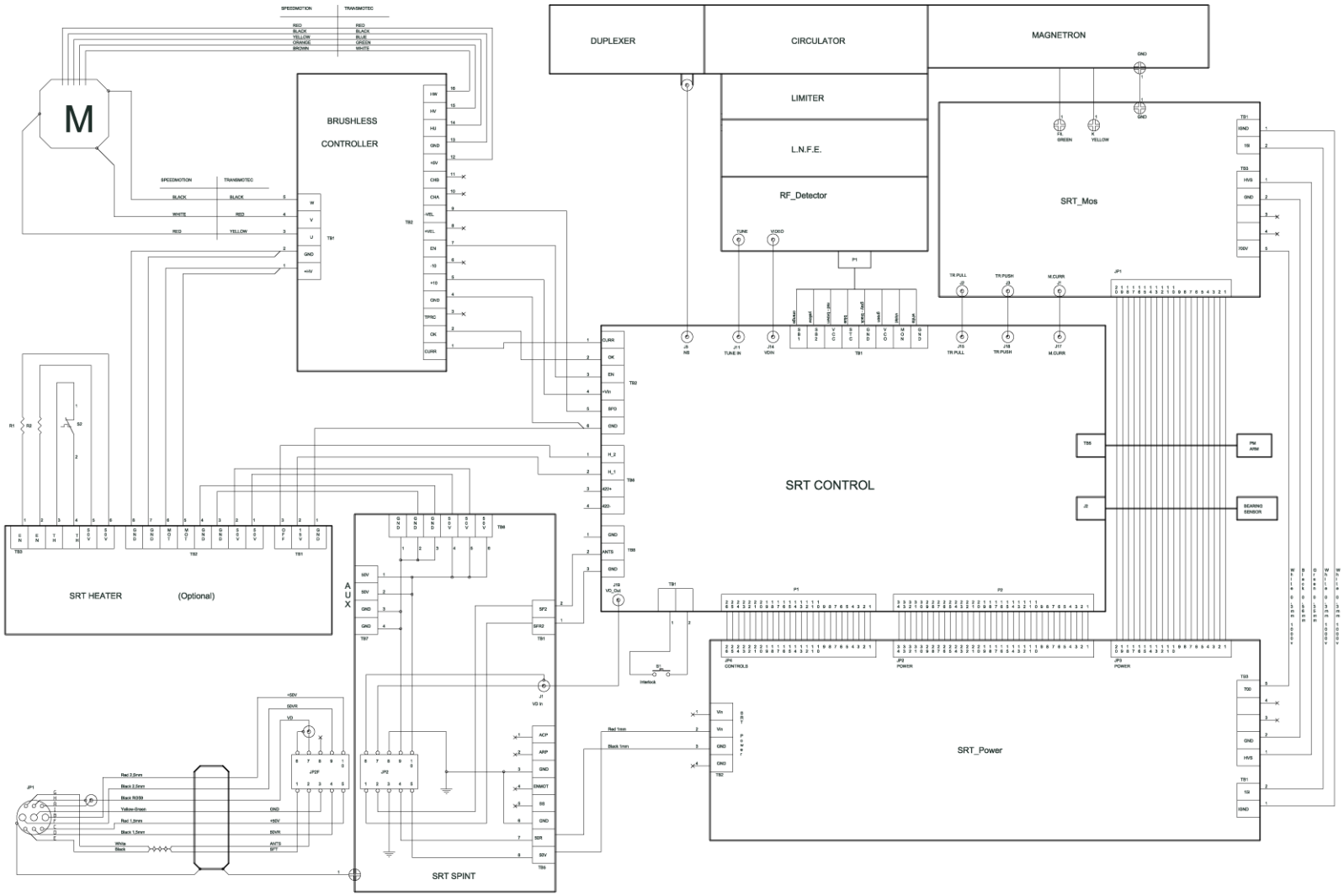
9.2.2 **Block diagram radar display with SRT S-Band Up Mast radar sensor**



9.2.3 **General interconnection diagram of BOARDs (standard version)**



9.2.4 **General interconnection diagram of BOARDs (version with SRT HEATER)**



9.3 SPECIFICATIONS

9.3.1 Dimensions and weights (also see outline drawings)

Width	**65,4 cm**
Depth	**47,8 cm**
Height	**76,5 cm**
Weight with 12 ft antenna	**75 + 50 kg**
Swing circle with 12 ft antenna	**362 cm**

9.3.2 Required power

Standard configuration	**115÷220 VAC - 56÷60 Hz or 48VDC**
Transceiver only	**80 W**
With 100 KN	**350 W**
With 100 KN (HSC)	**850 W**
Medium power cunsumption 30 kW / 12 SLP	**170 W**
Medium power cunsumption 30 kW / 12 SLP (HSC)	**280 W**

9.3.3 Environmental data

Operating temperature	**-25°C / +55°C As in IEC 60945**
Storage temperature	**-25°C / +70°C As in IEC 60945**
Relative humidity	**Up to 95% at + 40° As for IEC 60945**
Vibrations	**As for IEC 60945**
International Protection (IP)	**IP 66**

9.4 INSTALLATION

9.4.1 Installation principles

In order to obtain the best radar performance and accessibility, the following precautions should be taken:

- Space for the antenna to swing freely. See par.9.2 (Specifications; Antenna type)
- Safety and easy access for maintenance purposes. It is preferable to use a platform on the ship mast.
- The antenna to be accessible in all directions
- Avoid exposure to exhaust fumes from the funnel
- Avoid strong vibrations
- Avoid interference between two antennas
- Avoid obstacles in the radar beam, especially ahead of athwart ship's directions

If two radar sets are installed, their antennas should be installed at different levels.

The antennas can be mounted, either on a single mast construction, so they are on top of each-other or the antennas can be mounted on a platform, one on portside and one on starboard side.

The following formula and drawing, will help you to determine the correct distance and height between the two radar antennas. The 45° angle on the drawing is the actual vertical beam-width with a safety margin included.

Example:

"H = L",

H = height between the two antennas

L = the distance between the two antennas

If the distance L is 6 m, then the height should be = 6 m.

Blind sectors towards the bow and within a few degrees on port and/or starboard side caused by the structure of the ship must be avoided with great care. In case of a blind sector at the bow in mid-ships' position, it is advisable to mount the antennas on the starboard side of the ships' keel-line.

When obstacles are sufficiently far from the antenna, they will result in a blind sector on the radar display with approximately the same amplitude as observed by the human eye, but these obstacles can produce false echoes. An echo produced by an obstacle close to the antenna, can be suppressed by reflecting the antenna-beam skywards by mounting a reflector made of metal. This solution however does not eliminate the blind sector, but will reduce false echoes produced by the obstacle. The best position for the reflector can be found by testing out different positions.

It is highly recommended that the shipyard submit the drawings of the radar antenna position(s) to the manufacturer for approval.

The Installation consists of following basic steps:

- Mount the Unit without the Antenna on the mast
- Make relevant connector
- Install and connect the Performance Monitor (optional) arm
- Install the Safety Switch
- Mount the Antenna on the Unit

NOTE

The transceiver should be installed in such way that the performance monitor arm is not facing funnels or other big ships obstruction. Sector blanking is enabled to prevent false echoes caused by funnels and/or big ships construction (see above). If performance monitor arm is positioned, within this blanking area, the pedestal must be turned because the radar performance monitor is not working where there is no transmission in the sector of its sensor.

Installation of Safety Switch CHANGE: IT IS ON THE DC CORE OR ADAPTER BOX OR OPTIONAL FOR THE ADAPTER BOX EXTERNAL is compulsory. It is recommended to be installed at the bottom of the stairs giving access to the Antenna Pedestal. The waterproof switch is supplied by manufacturer, but a connection cable (2x2,5 mm^2) should be provided by the shipyard.

The Antenna Group must be covered by plastic sheet during any painting performed after the installation.

NOTE

In no case shall the Antenna be used to hoist the Pedestal up the mast.

9.4.2 **Mechanical installation**

The SRT consists of following units and type designations:

Pedestal with 30 kW transceiver **UP MAST/S-001**

12 feet antenna **ANT12LP/S-001**

Safety switch

(optional, always included in DC-CORE or SRT ADAPTER BOX)

9.4.2.1 Unit (Pedestal + Transceiver)

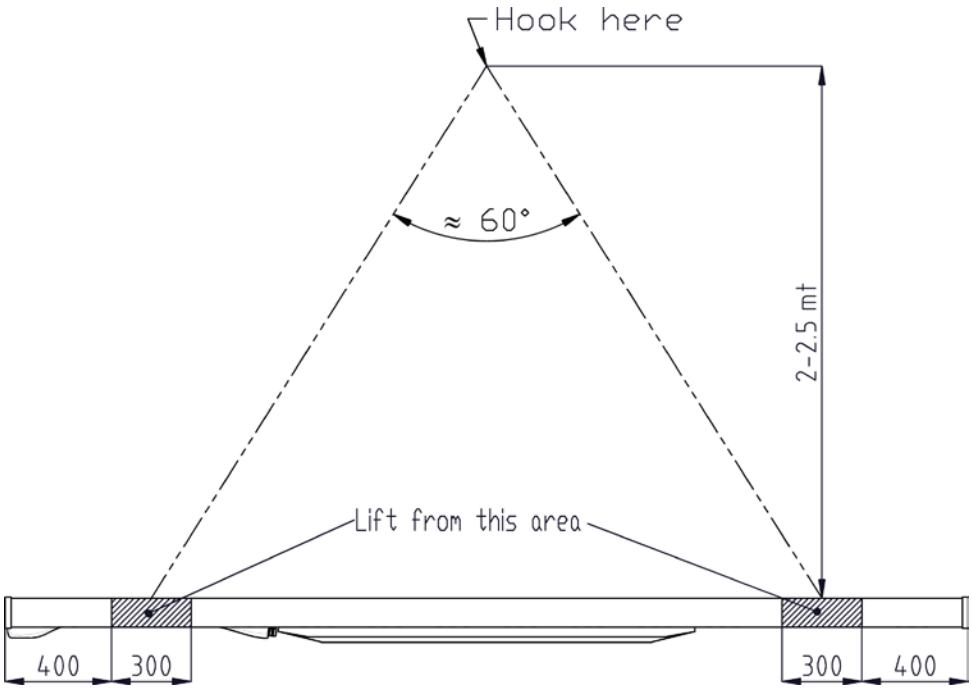
The pedestal should be mounted with its lid hinges pointed forward and cable glands pointed astern. However the antenna swinging plane must be horizontal in all directions when ship is upright on even keel. Consider giving ample space for service, especially astern of the antenna group. If such space can not be achieved, contact manufacturer for installation alternatives.

NOTE

The fixing materials to fasten the antenna pedestal to the ship's platform are not provided by the manufacturer. Assuming a platform plate thickness of 20 mm, four M10 stainless steel bolts of 65 mm length, with relative nuts grooves and washers, must be used. The tightening couple is 44 Nm.

9.4.2.2 Antenna

The antenna and the unit must be run up the mast separately and then assembled. The TXRX should not be lifted with the antenna already mounted.



1.1.26 *Antenna Position*

The mounting procedure of the antenna to the pedestal consists of following steps:

- Remove the waveguide protections on the antenna and pedestal.
- Mount the antenna over its support, check that the waveguide connections are on the same side. The antenna assumes the right position following two reference covers.
- Rest the antenna on the pedestal and tighten the 16 bolts holding the antenna. The tightening couple is 22 Nm

9.4.2.3 Safety switch (external is optional)

Usually the safety switch is located on the Radar Display DCORE or the optional SRT adapter Box.

Installation of safety switch is compulsory. The optional safety switch can be supplied by the manufacturer.

It is recommended to place the safety switch at the bottom of the stairs that are giving access to the radar mast. The switch must be mounted with the cable glands pointing down. Connect the cable as described in 9.4.3 Electrical installation.

9.4.2.4 Performance Monitor arm

To install the P.M. Arm proceed as follows:

- Connect the P.M. Arm for the radiation monitor on the SRT. The arm shall be angled upwards.

9.4.3 **Electrical installation**

The electrical installation of the SRT consists of cabling and connection to terminals as described below:

9.4.3.1 Multicore cable

Also see Multicore Cabling and Termination Principles.

> **NOTE**
> Use the installation materials for the Multicore cable which are delivered by the manufacturer to ensure proper connection.

Normally the cable (4 twisted pair + 2 Coax + 8 wire), P/N 55X456P001, is delivered to a length of 30 m. The Multicore cable includes wires for Power, Video, Trigger and Antenna data. It is therefore required to handle these cables with particular care.

9.4.3.2 Safety switch

The safety switch is supplied by the manufacturer. Cable from the safety switch to the Core is not included.

Check the Safety Switch is placed as described in par. 9.4.2 Mechanical Installation

Connect the two poles of the safety switch, on TB1 of the Core unit

The cable gland not used must be properly sealed

Carefully make sure that the switch is closed in “1” (On) position and open in “0” (Off) position

9.4.3.3 Grounding

Connect a tinned braided copper wire (>25 mm^2) between the GROUND TERMINAL on the SRT and the radar mast.

9.4.4 **Pre setup procedures**

This paragraph provides information concerning the preliminary controls and procedures to be done as a completion of the electrical installation and before supplying the unit with power and before performing the System Setup

Procedure:

NOTE
In this manual: Schematics with radar set may be changed without notice.

NOTE
Powering the Radar System is not included in the Pre Setup Procedure.

- Carry out a careful visual inspection of the installed components referring to the layouts of the unit and to the interconnection drawings
- Carefully check the integrity of the fuses

9.4.4.1 Ship power voltage

The unit must is connected to ship's main voltage through the Radar console DC-CORE or through the SRT adapter box.

Cable section shall be ≥ 4 mm to support a 15A current.

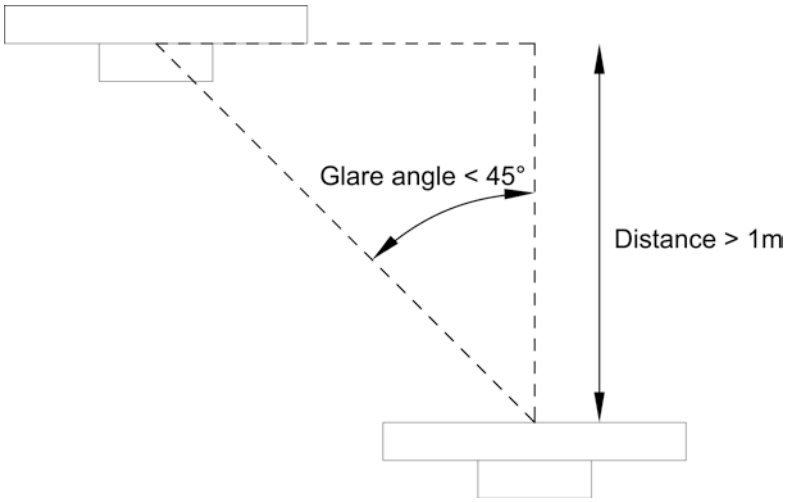
9.4.4.2 Compass safe distance

Every unit should be located outside the minimum magnetic compass safe distance according to the following table:

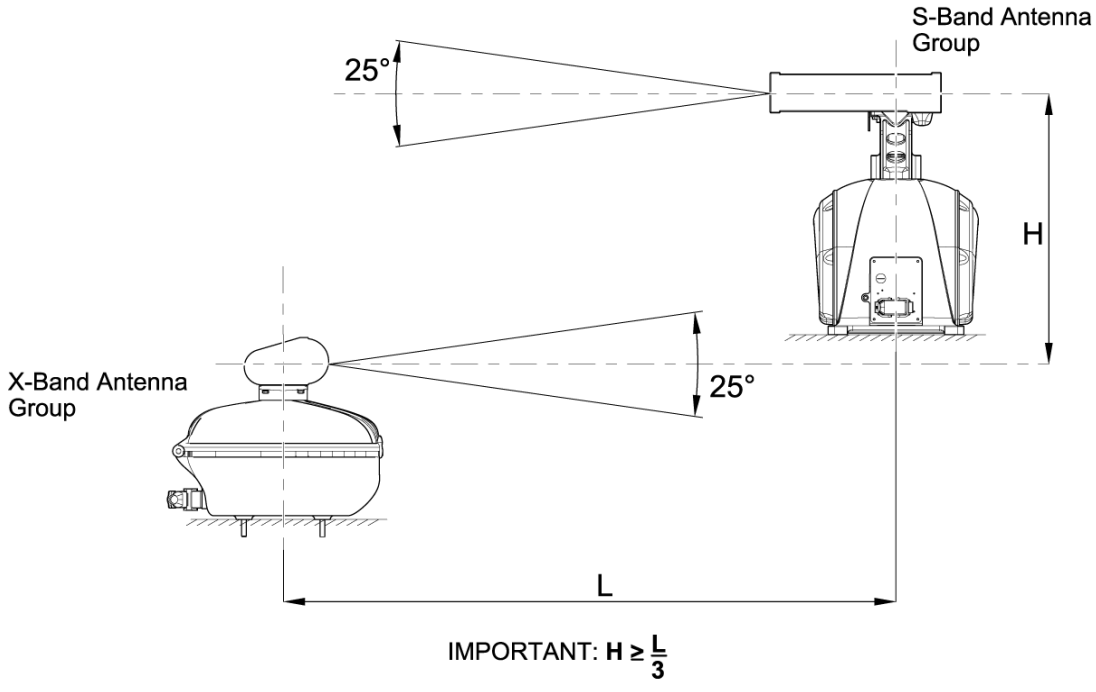
Table 9.4.1 Compass Safe Distance

SAFE DISTANCE TO THE STANDARD MAGNETIC COMPASS	**4,20 m**
SAFE DISTANCE TO THE STEERING MAGNETIC COMPASS	**2,75 m**
REDUCED SAFE DISTANCE TO THE STANDARD MAGNETIC COMPASS	**2,55 m**
REDUCED SAFE DISTANCE TO THE STEERING MAGNETIC COMPASS	**1,65 m**

9.5 **ANTENNA INSTALLATION**



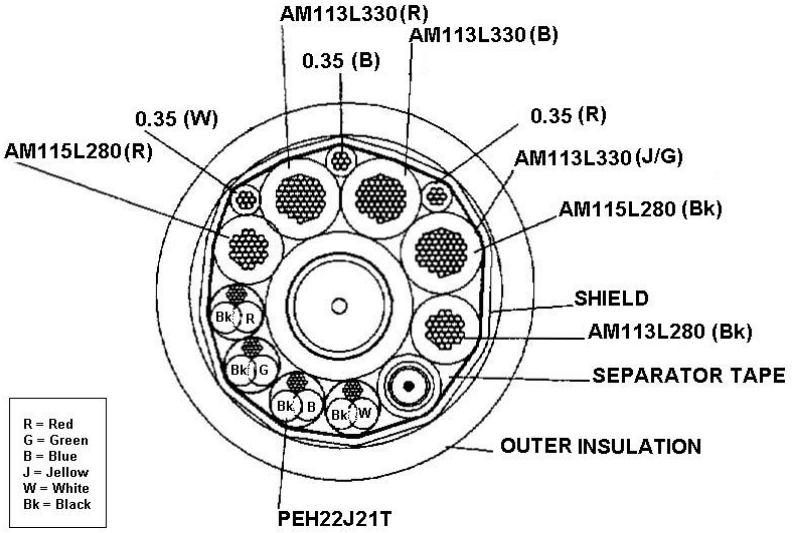
1.1.27 *Antenna Position*

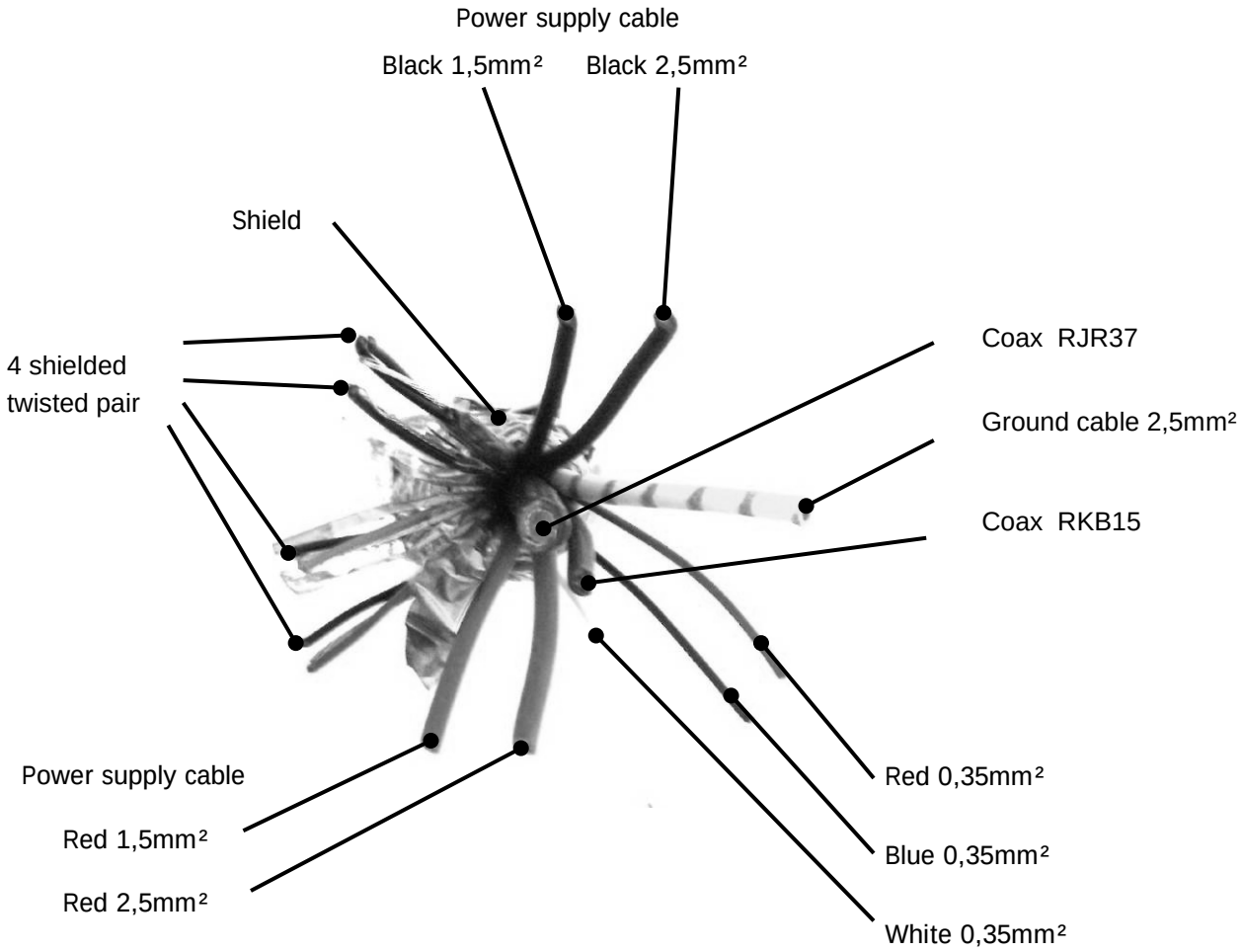


1.1.28 *Antenna Position*

9.6 MULTICORE CABLE TECHNICAL SPECIFICATION

Core overview of Multicore Cable:





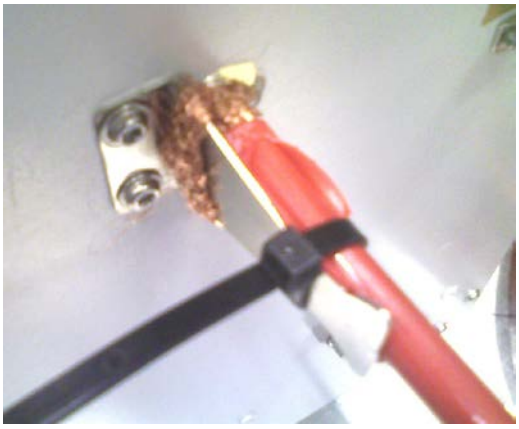
9.6.1 **Cable handling**

- Remove 60 cm of the outer insulation of the cable.

- Remove most of the shield, down to 5 cm, as indicated:

- Remove the main protective film and pull the shield over the cable outer isolation, as illustrated:

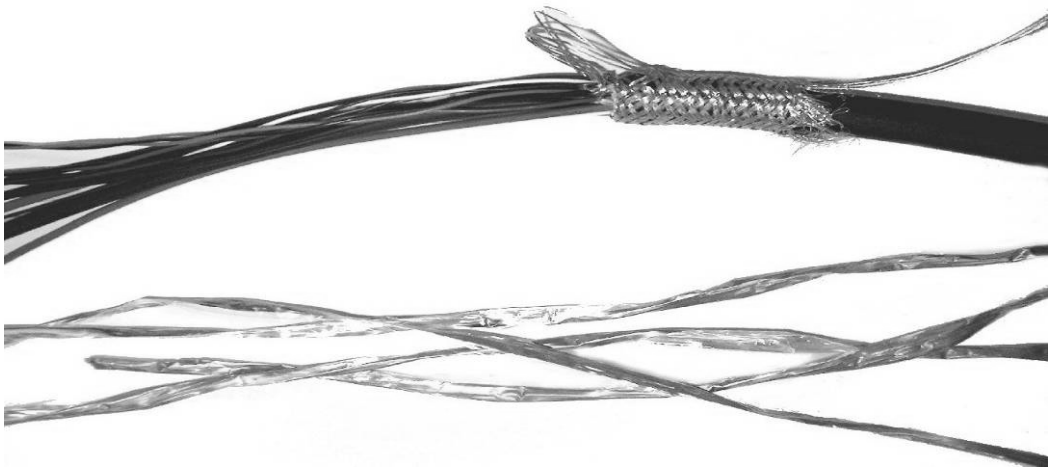
NOTE
When you have the video connection cable combined triaxial BNC,
the first cable shield must be connected to the frame of the SRT S-Band Up Mast
(Fig.1.1.30).



1.1.29 *Coaxial cable fixing*

9.6.2 **Main shield and inner shields handling**

- Remove the metallic film from each twisted pair cables and pass the 4 ground wires through the turned shield.



0.35 mm² cores

- Cut the core to the wanted length and dismantle the core for 10mm:

- Insert and crimp the blue-end terminal:

NOTE
End terminal should always be used.

- Double connection in one terminal (yellow terminal):

- Triple connection in one terminal (grey terminal):

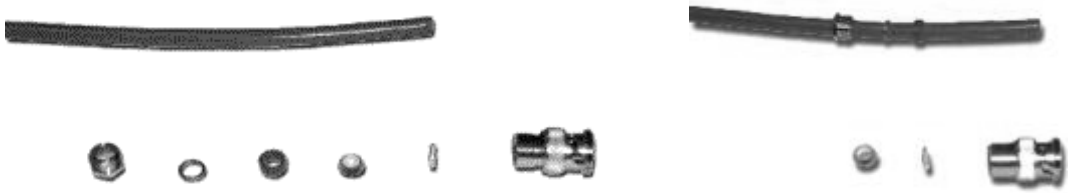
1,5 and 2,5 mm² cores

- Cut the core to the wanted length and dismantle the core for 10 mm:

NOTE
End terminal should always be used.

9.6.3 **RG coaxial cables**

Mechanical details of BNC connector:



Cut the cable to the wanted length.

Dismantle the outer isolation of the RG coaxial cable without damaging the shield, and put the related part of the BNC connector as below:

Details related to the ring of the BNC connector.

Take back the shield on the ring and trim exceeding shield:

Dismantle the outer isolation of the centre core without damaging the centre core and be sure that the shield is not shortened with the centre core:

Solder the centre core with the BNC pin.

Be careful not to damage the isolation (i.e. burned) during the solder process:

Mount the BNC connector as below:

9.7 **SOFTWARE UPGRADE**

The software installed on the processor used by SRT CONTROL can be updated. For this procedure, refer to the use of the consol

988-10609-003

SIMRAD

PRO SERIES

PRO.SIMRAD-YACHTING.COM